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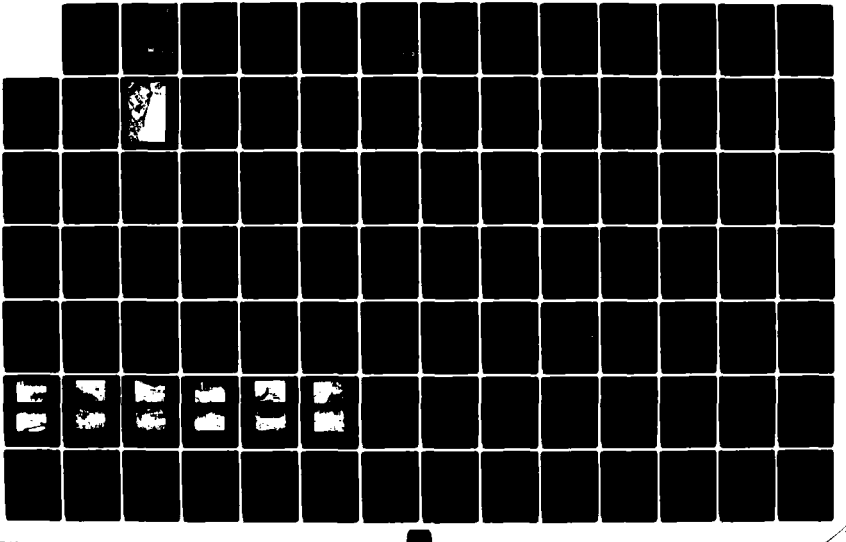

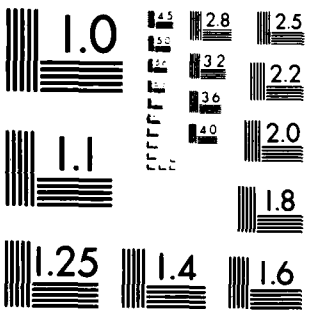

FARMINGTON RIVER BASIN
PLYMOUTH, CONNECTICUT

# MIDDLE POND DAM
# CT 00283

# PHASE I INSPECTION REPORT
# NATIONAL DAM INSPECTION PROGRAM





DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

JUNE 1981

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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18. SUPPLEMENTARY NOTES

Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,

Farmington River Basin
Plymouth, Connecticut

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The Middle Pond Dam consists of an earth embankment and stone masonry structure with a maximum height of 10 feet, a top width of 10 feet and a total length of 535 feet including overflow spillways of 21 feet and 29 feet located near the left end of the dam. Based on the visual inspection, the dam is judged to be in very poor condition. The dam is classified as "Small" in size with a "High" hazard potential. A test flood equal to ½ the Probable Maximum Flood was selected in accordance with the Corps of Engineers.

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254

REPLY TO
ATTENTION OF
NEDED

Honorable William A. O'Neill
Governor of the State of Connecticut
State Capitol
Hartford, Connecticut 06115

Dear Governor O'Neill:

Inclosed is a copy of the Middle Pond Dam (CT-00233) Phase I Inspection Report, prepared under the National Program for Inspection of Non-Federal Dams. The report is based upon a visual inspection, a review of past performance, and a preliminary hydrological analysis.

The preliminary hydrologic analysis indicated that the spillway capacity for the Middle Pond Dam would likely be exceeded by floods greater than 9 percent of the Probable Maximum Flood (PMF). Our screening criteria specifies that a dam classified as high hazard with a spillway capacity insufficient to discharge fifty percent of the PMF be judged as having a seriously inadequate spillway. As a result, this dam is assessed as unsafe, non-emergency, until more detailed studies prove otherwise or corrective measures are completed.

The term "unsafe" applied to a dam because of an inadequate spillway does not indicate the same degree of emergency as that term would if applied because of structural deficiency. It does indicate, however, that a severe storm may cause overtopping and possible failure of the dam, with significant damage and potential loss of life downstream.

We recommend that within twelve months from the date of this report the owner of the dam engage the services of a qualified registered engineer to determine further the potential of overtopping the dam and the need for and the means to increase project discharge capacity. Based on this determination, appropriate remedial mitigating measures should be designed and completed within 24 months of this date of notification. In the interim a detailed emergency operation plan and warning system should be promptly developed and round-the-clock surveillance should be provided during periods of heavy precipitation or high project discharge.

NEDED
Honorable William A. O'Neill

I approve the report and support the findings and recommendations described in Section 7, with qualifications as noted above. I request that you keep me informed of the actions taken to implement these recommendations since this follow-up is an important part of the program.

Copies of this report have been forwarded to the Department of Environmental Protection and to the owner, Terryville Fish and Game Club, Inc., Terryville, CT. Copies will be available to the public in thirty days.

I wish to thank you and the Department of Environmental Protection for your cooperation in this program.

Sincerely,

C. E. EDGAR, III
Colonel, Corps of Engineers
Commander and Division Engineer

# MIDDLE POND DAM
CT 00283

FARMINGTON RIVER BASIN
PLYMOUTH, CONNECTICUT



PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



49-042

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

IDENTIFICATION NO: CT 00283

NAME OF DAM: Middle Pond Dam

TOWN: Plymouth

COUNTY AND STATE: Litchfield County, Connecticut

STREAM: Pequabuck River

DATE OF INSPECTION: April 28, 1981

## BRIEF ASSESSMENT

The Middle Pond Dam consists of an earth embankment and stone masonry structure with a maximum height of 10 feet, a top width of 10 feet and a total length of 535 feet including overflow spillways of 21 feet and 29 feet located near the left end of the dam. A low earthen dike with a maximum height of about 3 feet, a top width of about 5 feet and a length of about 200 feet is located about 150 feet to the left of the dam.

The dam is owned by the Terryville Fish and Game Club, Inc. and impounds Middle Pond which is used for fishing.

Based on the visual inspection, the dam is judged to be in very poor condition. Features that could affect the future integrity of the dam are continued erosion of the upstream slope and crest, trees and stumps on the slopes, seepage through the dam, decreased spillway capacity due to blocking off the right spillway, deterioration of the right spillway, and lack of an operable outlet works.

The dam is classified as "Small" in size with a "High" hazard potential. A Test Flood equal to one-half the Probable Maximum Flood (1/2 PMF) was selected in accordance with the Corps of Engineers'

Recommended Guidelines for Safety Inspection of Dams. Because of the small surcharge capacity of the impoundment, the Test Flood outflow was assumed to equal the Test Flood inflow of 2,500 cfs. The stone masonry portion of the dam would be overtopped by 1.1 feet due to the Test Flood.

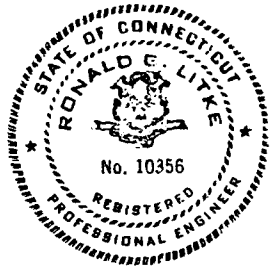
With the right spillway blocked the total spillway capacity of 430 cfs is equal to 17 percent of the Test Flood outflow. With the right spillway restored, the total spillway capacity of 550 cfs would be equal to 22 percent of the Test Flood outflow.

It is recommended that the right spillway be restored and the upstream embankment and stone masonry wall between the two spillways be repaired under the direction of a qualified, registered engineer. In addition, a qualified, registered engineer should be retained to design repairs to the outlet works, oversee tree and stump removal, investigate downstream seepage, design upstream slope protection, and perform a detailed hydraulic and hydrologic analysis. The owner should also clear the dam and dike of all brush and cut brush, maintain a grass cover on the crest and downstream slope of the dam, prepare an Operations and Maintenance Manual and a downstream warning system and institute a program of annual technical inspections by a qualified, registered engineer.

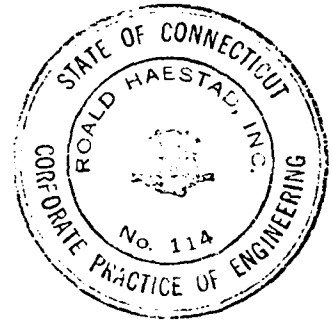
The owner should implement these recommendations as described herein and in greater detail in Section 7 of this report within one year of receipt of this Phase I Inspection Report, with the exceptions of restoring the right spillway; repairing the embankment, crest and stone masonry wall between the two spillways; and implementing a downstream warning system which should begin immediately upon receipt of this report.

Ronald G. Litke, P.E.
Project Engineer

Roald Haestad
President







This Phase I Inspection Report on Middle Pond Dam (CT-00283) has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgement and practice, and is hereby submitted for approval.

JOSEPH W. FINEGAN, JR., MEMBER
Water Control Branch
Engineering Division

ARAMAST MAHTESIAN, MEMBER
Geotechmical Engineering Branch
Engineering Division

CARNEY M. TERZIAN, CHAIRMAN
Design Branch
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRYAR
Chief, Engineering Division

## PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the

condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I Inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The Phase I Investigation does not include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety of the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

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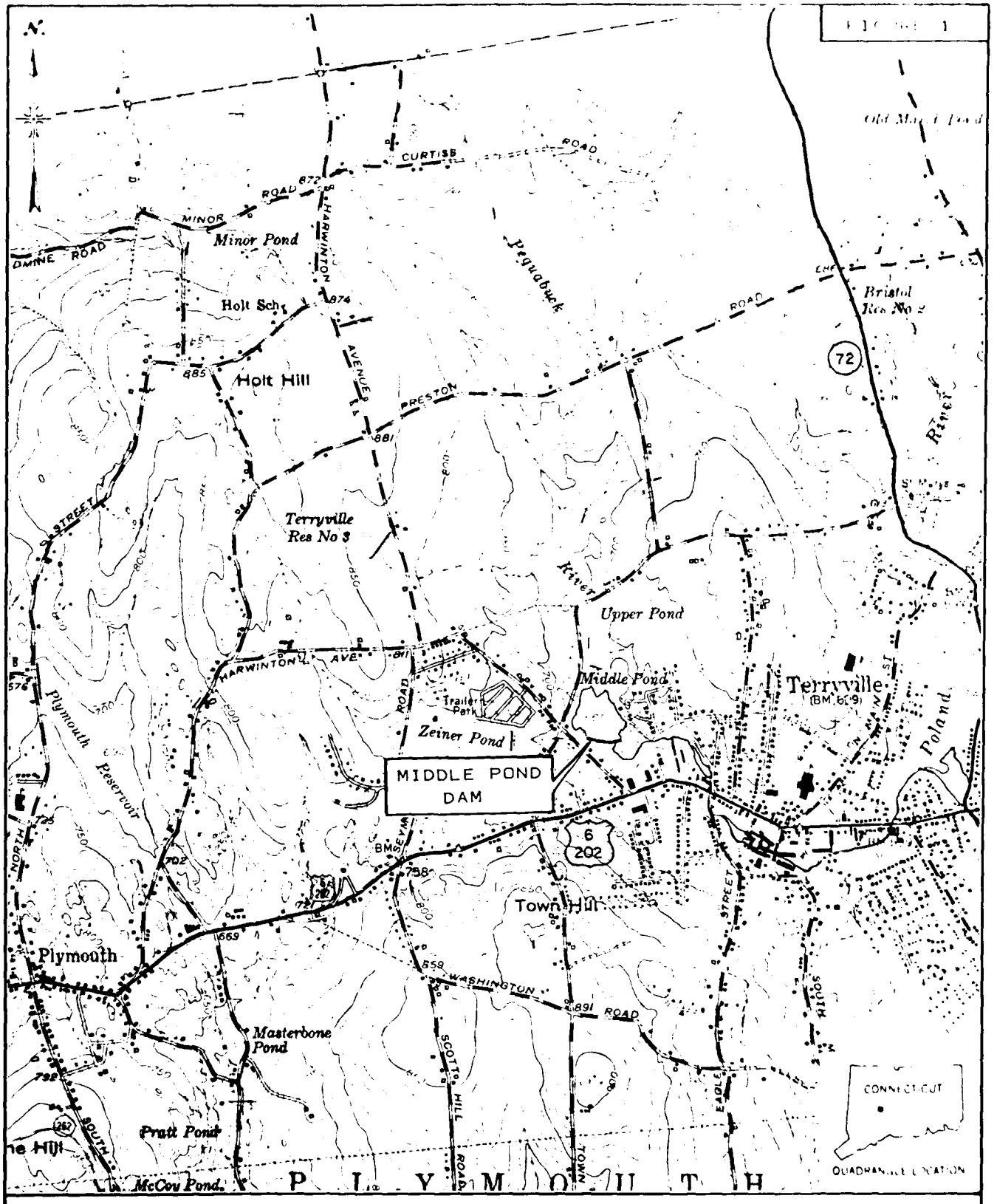



LOCATION PLAN

MIDDLE POND DAM
PLYMOUTH, CONNECTICUT

SCALE: 1" = 2000'

ROALD HAESTAD, INC.

THOMASTON QUADRANGLE 1969

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

# MIDDLE POND DAM

## PROJECT INFORMATION

SECTION 1

### 1.1 General

#### a. Authority

Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Roald Haestad, Inc., has been retained by the New England Division to inspect and report on selected dams in the State of Connecticut. Authorization and notice to proceed were issued to Roald Haestad, Inc. under a letter of March 30, 1981, from William E. Hodgson, Jr., Colonel, Corps of Engineers. Contract No. DACW33-80-C-0048 has been assigned by the Corps of Engineers for this work.

#### b. Purpose of Inspection

The purposes of the program are to:

1. Perform technical inspection and evaluation of non-federal dams to identify conditions requiring correction in a timely manner by non-federal interest.
2. Encourage and prepare the States to quickly initiate effective dam inspection programs for non-federal dams.
3. To update, verify and complete the National Inventory of Dams.

## 1.2 Description of Project

### a. Location

The dam is located on the Pequabuck River in the Terryville section of the Town of Plymouth, approximately 1,000 feet north of U.S. Routes 6 and 202 and east of Harwinton Avenue. The dam is shown on the Thomaston Quadrangle map having coordinates of latitude N41°-40.9' and longitude W73°-01.3'.

### b. Description of Dam and Appurtenances

The Middle Pond Dam consists of an earth embankment and stone masonry structure with a maximum height of 10 feet and a total length of 535 feet including overflow spillways of 21 and 29 feet located near the left end of the dam. From right to left, the dam consists of a 390 foot long earth embankment, the final 40 feet of which has a downstream stone masonry wall; a 21 foot long stone masonry overflow spillway; a 45 foot long earth embankment section with a downstream stone masonry wall; and a 29 foot long stone masonry overflow spillway which is connected to the left abutment by a 50 foot long earth embankment with a downstream stone masonry wall.

The earth embankment portion of the dam has a top width of about 10 feet, and upstream and downstream slopes of 2 horizontal to 1 vertical. There is no formal type of slope protection on the upstream slope of the dam.

The downstream stone masonry wall has a top width of about 3 feet. Some of the upper joints are mortared, but for the most part the masonry was laid up dry.

The spillways have stone masonry training walls downstream

of the dam and a freeboard of 2.5 feet from spillway crest to the top of the stone masonry portion of the dam. The 21 foot long right spillway is partially collapsed with several stones missing from the crest. Large concrete blocks and stone rubble have been placed upstream of this spillway to prevent flow over it. The top of the concrete blocks is about 1 foot higher than the spillway crest elevation.

The outlet works consist of a 2 foot wide by 2 foot high stone masonry conduit through the right spillway. The outlet was formerly controlled by an upstream gate but reportedly has been inoperative for many years.

A low earthen dike with a maximum height of about 3 feet and a top width of about 5 feet is located about 150 feet to the left of the dam. The dike is about 200 feet long and the crest is about 0.5 feet below the top of the stone masonry portion of the dam. The dike has an upstream slope of 2 horizontal to 1 vertical and a downstream slope of 7 horizontal to 1 vertical.

c. Size Classification - "Small"

According to the Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams, a dam is classified as "Small" in size if the height is between 25 feet and 40 feet or the dam impounds between 50 Acre-Feet and 1,000 Acre-Feet of water. The dam has a maximum height of 10 feet and a maximum storage capacity of 65 Acre-Feet. Therefore, the dam is classified as "Small" in size based on a storage capacity of 65 Acre-Feet.

d. Hazard Classification - "High"

Based upon the Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams, the hazard classification of the dam is "High". A dam failure analysis indicates that a failure

of Middle Pond Dam could result in the loss of more than a few lives.

The calculated flood wave would flood an apartment complex located 1,200 feet downstream of the dam to a depth of 2 feet. Another 1,200 feet downstream the flood waters would inundate several commercial and residential buildings and overtop West Main Street (U.S. Routes 6 and 202) and South Eagle Street by 2 feet. Further downstream the flood waters would overtop South Main Street and West Main Street again, inundating 4 commercial buildings and 4 residential buildings to a depth of 1 to 3 feet before reaching the confluence with the Poland River.

e. Ownership

Former Owner: Eagle Lock Company

Present Owner: Terryville Fish and Game Club, Inc.
Joseph Szulkowski, President
3 Joseph Street
Terryville, Connecticut 06786
(203) 582-5571

f. Operator

Walter Litke
12 Grove Street
Terryville, CT 06786
(203) 583-3214

Isadore J. Mackiweicz
1 Grove Street
Terryville, CT 06786
(203) 582-2969

g. Purpose of Dam

The dam impounds Middle Pond which is used for fishing by the Terryville Fish and Game Club, Inc. At the present time the Soil Conservation Service is investigating the possibility of incorporating the Middle Pond into a flood control project for the area. See pages B-3 and B-6 in Appendix B.

h. Design and Construction History

The dam was reported to have been constructed for the Eagle Lock Company around 1900. In 1980 concrete blocks and stone

rubble were placed upstream of the right spillway in an attempt to eliminate flow over the partially collapsed spillway.

i. Operational Procedures

There are no operational procedures in effect for the dam.

## 1.3 Pertinent Data

### a. Drainage Area

The drainage area consists of 2.4 square miles of "rolling" wooded hills with scattered residential development.

### b. Discharge at Damsite

Discharge at damsite is over a 29 foot long stone masonry overflow spillway. A second spillway is partially collapsed and blocked by large concrete blocks and stone rubble. The outlet works is reported to be inoperative.

1. Outlet Works (conduits) Size: 2'x 2' stone masonry conduit

   Invert Elevation: 657.7

   Discharge Capacity: 50 cfs estimated (Inoperative)

2. Maximum Known Flood at Damsite: Overtopped Dike 1955

| | RT SPILLWAY BLOCKED | RT SPILLWAY RESTORED |
|---|---|---|
| 3. Ungated Spillway Capacity at Top of Dam: | 430 cfs | 550 cfs |
| Elevation: | 667.5 | 667.5 |
| 4. Ungated Spillway Capacity at Test Flood Elevation: | 800 cfs | 950 cfs |
| Elevation: | 668.6 | 668.6 |
| 5. Gated Spillway Capacity at Normal Pool Elevation: | N/A | N/A |
| Elevation: | N/A | N/A |
| 6. Gated Spillway Capacity at Test Flood Elevation: | N/A | N/A |
| Elevation: | N/A | N/A |
| 7. Total Spillway Capacity at Test Flood Elevation: | 800 cfs | 950 cfs |
| Elevation: | 668.6 | 668.6 |
| 8. Total Project Discharge at Top of Dam: | 635 cfs* | 755 cfs* |
| Elevation: | 667.5 | 667.5 |
| 9. Total Project Discharge at Test Flood Elevation: | 2500 cfs | 2500 cfs |
| Elevation: | 668.6 | 668.5 |

*includes flow over dike.

c. Elevation - Feet Above Mean Sea Level (NGVD)

| | | |
|---|---|---|
| 1. | Streambed at Toe of Dam: | 657.6 |
| 2. | Bottom of Cutoff: | Unknown |
| 3. | Maximum Tailwater: | N/A |
| 4. | Normal Pool: | 665.0 |
| 5. | Full Flood Control Pool: | N/A |
| 6. | Spillway Crest: | 665.0 |
| 7. | Design Surcharge - Original Design: | Unknown |
| 8. | Top of Dam: | 667.5 Stone Masonry |
| 9. | Test Flood Surcharge: | 668.6 |

d. Reservoir - Length in Feet

| | | |
|---|---|---|
| 1. | Normal Pool: | 900 |
| 2. | Flood Control Pool: | N/A |
| 3. | Spillway Crest Pool: | 900 |
| 4. | Top of Dam: | 950 |
| 5. | Test Flood Pool: | 1000 |

e. Storage - Acre-feet

| | | |
|---|---|---|
| 1. | Normal Pool: | 30 |
| 2. | Flood Control Pool: | N/A |
| 3. | Spillway Crest Pool: | 30 |
| 4. | Top of Dam: | 65 |
| 5. | Test Flood Pool: | 70 |

f. Reservoir Surface - Acres

| | | |
|---|---|---|
| 1. | Normal Pool: | 10 |
| 2. | Flood-Control Pool: | N/A |
| 3. | Spillway Crest: | 10 |
| 4. | Test Flood Pool: | 13 |
| 5. | Top of Dam: | 12 |

| | | Dam | Dike |
|---|---|---|---|
| g. | Dam | | |
| | 1. Type: | Earth Embankment with downstream stone masonry along part of the dam | Earth Embankment |
| | 2. Length: | 535 including spillways | 200'+ |
| | 3. Height: | 10 feet | 3 feet |
| | 4. Top Width: | 10 feet | 5 feet |
| | 5. Side Slopes: | 2 horiz. to 1 vert. U.S.<br>2 horiz. to 1 vert. D.S. | 2 horiz. to 1 vert. U.S.<br>7 horiz. to 1 vert. D.S. |
| | 6. Zoning: | None known | None known |
| | 7. Impervious Core: | None known | None known |
| | 8. Cutoff: | None known | None known |
| | 9. Grout Curtain: | None known | None known |
| | 10. Other: | | |
| h. | Diversion and Regulating Tunnel | N/A | N/A |

| | | Right | Left |
|---|---|---|---|
| i. | Spillway | | |
| | 1. Type: | Broad Crested Stone Masonry Overflow Weir obstructed w/ concrete blocks | Broad Crested Stone Masonry Overflow Weir |
| | 2. Length of Weir: | 21' | 29' |
| | 3. Crest Elevation with Flash Boards: | N/A | N/A |
| | without Flash Boards: | 666.0 Top of concrete blocks | 665.0 |
| | 4. Gates: | N/A | N/A |
| | 5. Upstream Channel: | Blocked by concrete blocks and rubble | Lined with stone |
| | 6. Downstream Channel: | Natural Channel | Natural Channel |
| | 7. General: | Stone masonry in poor condition | Good condition |
| j. | Regulating Outlets | | |
| | 1. Invert: | 657.7 | |
| | 2. Size: | 2' x 2' | |
| | 3. Description: | Stone Masonry Conduit | |
| | 4. Control Mechanism: | Upstream Gate | |
| | 5. Other: | Inoperative | |

## ENGINEERING DATA
## SECTION 2

### 2.1 Design Data

There was no information available for review on the design of the dam.

### 2.2 Construction Data

There was no information available for review on the original construction of the dam. The dam was reported to have been constructed for the Eagle Lock Company around 1900. The right spillway was blocked off in 1980.

### 2.3 Operation Data

Operation data available for review consisted of an Inspection Report by S.E. Minor and Co, Inc., Civil Engineers, July 15, 1974, for the Connecticut Department of Environmental Protection; an Inspection Report by Kent A. Healy, ScD, Soils and Foundation Engineering, October 4, 1977, for the owner; and a second Inspection Report prepared for the Connecticut Department of Environmental Protection by their Consultant Charles J. Pelletier on August 9, 1978.

### 2.4 Evaluation of Data

a. Avalability

Existing data was available from the State of Connecticut, Department of Environmental Protection.

b. Adequacy

As there was no information available on the design or construction of the dam, the assessment of the condition of the dam was based on the visual inspection, and the hydraulic and hydrologic calculations performed for this report.

## VISUAL INSPECTION

## SECTION 3

### 3.1 Findings

#### a. General

The visual inspection of the dam was conducted on April 28, 1981. The inspection team was accompanied by Mr. Walter Litke and Mr. Isadore J. Mackiweicz of the Terryville Fish and Game Club, Inc. At the time of inspection the water level was at spillway elevation.

From right to left the dam consists of a 390 foot long earth embankment, the final 40 feet of which has a downstream stone masonry wall; a 21 foot long stone masonry overflow spillway; a 45 foot long earth embankment with a downstream stone masonry wall; and a 29 foot long stone masonry overflow spillway, which is connected to the left abutment by a 50 foot long earth embankment with a downstream stone masonry wall, Photo 1. A low earthen dike is located about 150 feet to the left of the dam.

The general condition of the dam at the time of inspection was very poor.

#### b. Dam

The upstream slope of the earth embankment portion of the dam is covered with brush and boulders, Photo 2. Several tree stumps up to about 12 inches in diameter were observed on the upstream slope of the dam. The crest of the dam is very irregular, Photo 2. Immediately next to and approximately 125 feet to the right of the right spillway the crest appears to have been recently filled, Photo 2. It is reported that these areas were filled to repair damage caused to the crest when large concrete blocks were

placed upstream of the right spillway. Portions of the crest are covered with a poor growth of grass. The embankment appears to have been constructed of *random fill*, with boulders present on the surface.

There are numerous large tree stumps on the downstream slope of the dam. The largest measured 36 inches in diameter, Photo 3. Cut brush which was previously cleared from the dam is piled on the downstream slopes, making a thorough inspection of the slopes impossible. Portions of the slope are grass-covered. A large depression or hole approximately 5 feet in diameter and covered with cut brush was observed to the left of the 36-inch diameter tree stump, Photo 4.

Downstream of the dam the area from the right spillway to about 200 feet to the right is swampy and covered with moisture-loving vegetation, Photo 5. Near the left end of the dam a small depression downstream of the stone masonry wall contains standing water.

The downstream stone masonry wall has a top width of about 3 feet. Some of the joints in the upper portion of the wall are mortared, but for the most part the masonry was laid up dry, Photos 6 and 8. A rule was extended approximately 32 inches into one of the open joints. The wall between the left spillway and the left abutment is in good condition. Between the two spillways the upper portion of the wall is displaced approximately 9 - 10 inches near the left end, Photo 6, and is leaning downstream at the right end, Photo 7. Where the wall is displaced the upstream embankment has been eroded to below the water surface, Photo 11.

Water is leaking through this area at a rate of about 2 - 3 gpm, Photo 6. Trees and brush are present upstream of the stone masonry wall to the left of the right spillway, Photo 9.

Dike

About 150 feet to the left of the dam is a 200 foot long earthen dike. The dike is about 3 feet high and has a crest width of 5 feet. The surface is covered with trees and brush and has a footpath worn from trespassers. There is no riprap on the upstream slope and erosion has occurred at the waterline. The crest elevation of the dike is about 0.5 feet lower than the stone masonry portion of the dam.

c. Appurtenant Structures

The appurtenant structures consist of two overflow spillways located near the left end of the dam.

The right spillway is partially collapsed with several stones missing from the crest, Photos 7 and 8. Large concrete blocks and stone rubble have been placed upstream of this spillway in an attempt to eliminate flow over this area, Photo 9. A 2 foot wide by 2 foot high stone conduit through the left end of the spillway is a former outlet which was controlled by an upstream gate. The gate reportedly has not been operable for many years and was not observed.

The left spillway is in fair condition with some water leaking through the top joints, Photos 10 and 11. There are voids in the stone masonry, particularly near the right end where a ruler was extended 32 inches into one void.

d. Reservoir Area

There were no indications of instability along the edges of the reservoir in the vicinity of the dam or dike.

e. Downstream Channel

The downstream channel is the Pequabuck River. The channel floor consists of boulders and cobbles. There are logs across the channel and overhanging trees, Photo 12.

3.2 Evaluation

Based on the visual observations the dam appears to be in very poor condition. The following features could affect the future integrity of the dam:

1. Continued erosion of the upstream slope and crest of the dike and dam, particularly in the areas adjoining the spillways could lead to a failure of the downstream stone masonry wall resulting in a breach of the dam.
2. The roots from tree stumps present on the slopes of the dam and dike could, upon rotting, provide paths for seepage through the structures, leading to piping.
3. Continued seepage through the dam could lead to internal erosion or piping.
4. The concrete blocks and stone rubble placed upstream of the right spillway reduces the project discharge capacity.
5. Continued deterioration of the right spillway could lead to a breach of the dam.
6. The lack of an operable outlet works does not provide a means to lower the water level in the event of an emergency.

SECTION 4

## 4.1 Operational Procedures

### a. General

There are no operational procedures in effect for the dam.

### b. Description of Any Warning System in Effect

There is no warning system in effect for the dam.

## 4.2 Maintenance Procedures

### a. General

Trees and brush were cut from the slopes of the dam in 1980. The cut brush remains on the downstream slope of the dam.

### b. Operating Facilities

There are no maintenance procedures in effect for the operating facilities. The upstream gate for the outlet works reportedly has been inoperative for many years.

## 4.3 Evaluation

Present Operation and Maintenance Procedures are inadequate as is evident by the present condition of the dam and right spillway. An Operations and Maintenance Manual should be prepared for the dam, a downstream warning system should be developed and a program of annual technical inspections should be instituted.

SECTION 5

## 5.1 General

There are two broad-crested stone masonry spillways at Middle Pond Dam. The 29 foot long left spillway is in fair condition and has a freeboard of 2.5 feet from spillway crest to the adjacent stone masonry portion of the dam. The 21 foot long right spillway is in poor condition with several stones missing from the crest. Large concrete blocks and stone rubble have been placed upstream of the spillway to prevent flow. The tops of the concrete blocks are 1.5 feet below the top of the stone masonry portion of the dam. Both spillways discharge to the Pequabuck River channel through a wooded swamp immediately below the dam.

An earthen embankment 390 feet long extends from the right spillway to the right abutment and is about 0.5 feet higher than the top of the downstream stone masonry walls adjacent to the spillways.

A low earthen dike is located about 150 feet to the left of the dam. The dike is about 200 feet long and the crest is 0.5 feet below the stone masonry portion of the dam.

The dam has a tributary watershed of 2.4 square miles. The terrain is "rolling" wooded hills with only scattered residential development. The watershed has one other significant pond which controls about 0.35 square miles of the watershed. The watershed has a maximum elevation of 1060 at the northern end and an elevation of 665 at the spillway. The storage capacity of the impoundment is about 65 Acre-Feet at the top of the dam, Elevation 668.0.

The outlet works consist of a stone masonry conduit 2 feet wide by 2 feet high through the right spillway. The outlet was formerly operated by an upstream gate but reportedly has been inoperative for many years.

5.2 Design Data

No design or construction data was available for the dam.

5.3 Experience Data

It is reported that the dike was overtopped during the 1955 flood.

5.4 Test Flood Analysis

Based on the dam failure analysis, the dam is classified as "High" hazard potential. The dam has a maximum height of 10 feet and is classified as "Small" in size based on a storage capacity of 65 Acre-Feet. According to the Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams, the Test Flood for a "Small" dam with a "High" hazard potential should be in the range of one-half the Probable Maximum Flood (1/2 PMF) to the Probable Maximum Flood (PMF).

A Test Flood equal to the 1/2 PMF was selected because of the low hydraulic height and small storage capacity of the dam. The Test Flood was calculated using a peak inflow for the PMF of 2,075 cubic feet per second per square mile (csm) from the Corps of Engineers' Guide Curves for "rolling" terrain and the 2.4 square mile watershed of Middle Pond Da.. The peak 1/2 PMF inflow was calculated to be 2,500 cfs. As the surcharge storage capacity of the impoundment was minimal, inflow was assumed to equal outflow. The Test Flood outflow would overtop the stone masonry

portion of the dam by 1.1 feet, the earth embankment by 0.6 feet and the dike by 1.6 feet.

Total discharge capacity with the right spillway partially blocked by the concrete blocks was calculated to be about 430 cfs or 17 percent of the 1/2 PMF Test Flood before overtopping the stone masonry portion of the dam. Restoring the right spillway to its original condition would provide a total discharge capacity of 550 cfs or 22 percent of the Test Flood.

5.5 Dam Failure Analysis

A dam failure analysis was made using the Corps of Engineers' ' "Rule of Thumb" Guidance for Estimating Downstream Dam Failure Hydrographs' to calculate the peak outflow due to a dam failure. Failure was assumed with the water level at the top of the dam. The 10 foot high by 70 foot wide breach would release up to 3,900 cfs into the Pequabuck River channel below the dam. The above figure includes a discharge of 200 cfs over the dike, but no flow from the spillways, as they were assumed to be included in the breach.

The pre-failure flows were taken into consideration in the flood routing and the volumes occupied by the flows in the downstream reaches were subtracted from the volumes available for the dam breach flows.

Upon failure of the dam the flood wave would enter a large swamp. The initial impact area is an apartment complex 1,200 feet downstream of the dam that would be flooded to a depth of 2 feet. Another 1,200 feet downstream the flood waters would inundate several commercial and residential buildings and overtop West Main

Street (U.S. Routes 6 and 202) and South Eagle Street by 2 feet. Further downstream the flood would overtop South Main Street and West Main Street once again, inundating 4 other commercial buildings and 4 residential buildings to a depth of 1 to 3 feet before reaching the confluence with the Poland River.

The Pequabuck River channel can accomodate the maximum spillway discharge of 430 cfs prior to dam failure without overtopping the river banks.

The failure of Middle Pond Dam could result in the loss of more than a few lives and extensive downstream property damage. Therefore, the dam is classified as "High" hazard potential.

## 6.1 Visual Observations

The visual observations indicate that erosion of the upstream embankment in the area between the two spillways has resulted in leaning and buldging of the downstream stone masonry wall. Continued flow over the right spillway could lead to further collapse, possibly resulting in a breach of the dam. The future integrity of the dam could also be affected by the following:

1. Seepage along the root systems of large tree stumps present on the upstream and downstream slopes of the dam,
2. Decreased spillway capacity due to the blocking of the right spillway, and
3. The lack of an operable outlet works.

## 6.2 Design and Construction Data

There was no information available on the design and construction of the dam.

## 6.3 Post-Construction Changes

Large concrete blocks and stone rubble were placed upstream of the right spillway in an attempt to eliminate flow over it.

## 6.4 Seismic Stability

The dam is located in Seismic Zone I and in accordance with the recommended Phase I Guidelines does not warrant seismic stability analysis.

## 7.1 Dam Assessment

### a. Condition

On the basis of the visual inspection the dam is judged to be in very poor condition. The future integrity of the dam could be affected by:

1. Continued erosion of the upstream slope and crest, particularly in the areas adjoining the spillways.
2. Root systems from large tree stumps present on the upstream and downstream slopes of the dam.
3. Continued seepage through the dam.
4. Decreased spillway capacity due to blocking off of the right spillway.
5. Continued deterioration of the right spillway.
6. The lack of an operable outlet works.
7. Overtopping of the dike which is approximately 0.5 feet lower in elevation than the stone masonry portion of the dam.

An evaluation of the hydraulic and hydrologic features of the dam determined that the spillways are capable of passing 17 percent of the Test Flood outflow with the right spillway blocked and 22 percent of the Test Flood outflow with the right spillway restored.

### b. Adequacy of Information

As there was no design or construction information available, the assessment of the condition of the dam is based on the

visual inspection, field surveys and the hydraulic and hydrologic calculations performed for this report.

c. Urgency

The recommendations presented in Sections 7.2 and 7.3 should be carried out by the owner within one year of receipt of this report, with the exceptions of restoring the right spillway; repairing the embankment, crest and stone masonry wall between the two spillways; and implementing a downstream warning system, which should begin immediately upon receipt of this Phase I Inspection Report.

7.2 Recommendations

The following recommendations should be carried out under the direction of a qualified, registered engineer:

1. The concrete blocks and stone rubble obstructing the right spillway should be removed and the spillway repaired.
2. The upstream embankment, crest and stone masonry wall between the spillways should be repaired.
3. Restore or replace the outlet works.
4. Remove the trees, tree stumps and root systems from the slopes of the dam and dike and within 20 feet of the toes. Backfill the holes with selected material.
5. Investigate the downstream seepage and recommend seepage control or monitoring measures.
6. Design and construct upstream slope protection for the dam and dike.
7. Perform a detailed hydraulic and hydrologic analysis to determine the need for and means to provide additional project discharge capacity, and to determine the necessity of raising the dike.

8. Fill depressions on the downstream slopes with selected material, properly compacted.

The owner shall implement all of the engineer's recommendations.

7.3 Remedial Measures

a. Operation and Maintenance Procedures

1. Cut brush from the dam and dike and remove cut brush from the embankment and toe area.
2. Maintain a grass cover on the downstream slope of the dam.
3. An Operations and Maintenance Manual should be prepared.
4. A downstream warning system should be developed and put into effect.
5. A program of annual technical inspections by a qualified, registered engineer should be instituted.

7.4 Alternatives

If Recommendation Nos. 1 and 2 made under Section 7.2 of this report and Remedial Measure No. 4 under Section 7.3 of this report are not implemented immediately upon receipt of this report, the pond should be drained.

# APPENDIX A

## VISUAL CHECK LIST WITH COMMENTS

# VISUAL INSPECTION CHECK LIST
## PARTY ORGANIZATION

PROJECT: Middle Pond Dam

DATE: 28 April 1981 TIME: 1:30 p.m. WEATHER: Cloudy 55°F

W.S. ELEVATION: 665.0 U.S. N/A DN.S
(spillway elevation)

| | PARTY | DISCIPLINE |
|---|---|---|
| 1. | Roald Haestad, P.E. - Roald Haestad, Inc. | Civil/Geotechnical |
| 2. | Donald L. Smith, P.E. - Roald Haestad, Inc. | Civil/Hydrologic |
| 3. | Ronald G. Litke, P.E. - Roald Haestad, Inc. | Civil/Structural |
| 4. | Walter Litke - Terryville Fish and Game Club | Owner's representative |
| 5. | Isadore J. Mackiweicz - Terryville Fish & Game Club | Owner's representative |
| 6. | | |

| | PROJECT FEATURE | INSPECTED BY | REMARKS |
|---|---|---|---|
| 1. | Dam Embankment | RH,DLS,RGL | Numerous large tree stumps on slopes |
| 2. | Dike Embankment | RH,DLS,RGL | Poor |
| 3. | Outlet Works - Intake Channel & Intake Structure | RH,DLS,RGL | None observed |
| 4. | Outlet Works - Transition & Conduit | RH,DLS,RGL | 2' x 2' stone conduit through right spillway |
| 5. | Outlet Works - Outlet Structure & Outlet Channel | RH,DLS,RGL | No structure; outlets at face of spillway |
| 6. | Outlet Works - Right Spill. Weir, Appr. & Dis. Chan. | RH,DLS,RGL | Blocked by concrete and stone rubble |
| 7. | Outlet Works - Left Spill. Weir, Appr. & Dis. Chan. | RH,DLS,RGL | Fair condition |
| 8. | | | |
| 9. | | | |
| 10. | | | |
| 11. | | | |
| 12. | | | |

# PERIODIC INSPECTION CHECK LIST

PROJECT: Middle Pond Dam DATE: 28 April 1981

PROJECT FEATURE: Dam Embankment NAME: RH

DISCIPLINE: Civil Engineers NAME: DLS,RGL

| AREA ELEVATION | CONDITIONS |
|---|---|
| DAM EMBANKMENT | |
| CREST ELEVATION | 668.0 |
| CURRENT POOL ELEVATION | 665.0 (spillway) |
| MAXIMUM IMPOUNDMENT TO DATE | 667± (August 1955) |
| SURFACE CRACKS | None observed |
| PAVEMENT CONDITION | Poor growth of grass on portions; new fill in areas damaged while installing concrete blocks at right spillway. |
| MOVEMENT OR SETTLEMENT OF CREST | Too irregular to judge |
| LATERAL MOVEMENT | None observed |
| VERTICAL ALIGNMENT | Too irregular to judge |
| HORIZONTAL ALIGNMENT | Too irregular to judge |
| CONDITION AT ABUTMENT AND AT CONCRETE STRUCTURES | Earth embankment eroded to below water surface in several areas upstream of stone masonry wall |
| INDICATIONS OF MOVEMENT OF STRUCTURAL ITEMS ON SLOPES | No structural items on slopes |
| TRESPASSING ON SLOPES | Trespass erosion on upstream slopes |
| VEGETATION ON SLOPES | Poor grass cover on d.s. slope; numerous tree stumps on u.s. and d.s. slopes |
| SLOUGHING OR EROSION OF SLOPES OR ABUTMENTS | Erosion of slopes; 5' diameter hole or depression to left of 36" stump |
| ROCK SLOPE PROTECTION - RIPRAP FAILURES | Boulder present on upstream slope; no formal slope protection |
| UNUSUAL MOVEMENT OR CRACKING AT OR NEAR TOES | None observed |
| UNUSUAL EMBANKMENT OR DOWNSTREAM SEEPAGE | Leakage through stone masonry wall to right of left spillway 2 - 3 gpm. Area downstream of dam swampy. |
| PIPING OR BOILS | None observed |
| FOUNDATION DRAINAGE FEATURES | None known |
| TOE DRAINS | N/A |
| INSTRUMENTATION SYSTEM | N/A |

# PERIODIC INSPECTION CHECK LIST

PROJECT: Middle Pond Dam DATE: 28 April 1981

PROJECT FEATURE: Dike Embankment NAME: RJ

DISCIPLINE: Civil Engineers NAME: DLS, RGL

| AREA EVALUATED | CONDITIONS |
|---|---|
| DIKE EMBANKMENT | |
| CREST ELEVATION | 667± |
| CURRENT POOL ELEVATION | 665.0 |
| MAXIMUM IMPOUNDMENT TO DATE | Dike overtopped in 1955 |
| SURFACE CRACKS | None observed |
| PAVEMENT CONDITION | No pavement, brush and tree growth |
| MOVEMENT OR SETTLEMENT OF CREST | Too irregular to judge |
| LATERAL MOVEMENT | None observed |
| VERTICAL ALIGNMENT | Too irregular to judge |
| HORIZONTAL ALIGNMENT | Too irregular to judge |
| CONDITIONS AT ABUTMENT AND AT CONCRETE STRUCTURES | Too irregular to judge |
| INDICATIONS OF MOVEMENT OF STRUCTURAL ITEMS ON SLOPES | No structural items on slopes |
| TRESPASSING ON SLOPES | Footpath observed |
| VEGETATION ON SLOPES | Brush and tree growth |
| SLOUGHING OR EROSION OF SLOPES OR ABUTMENTS | Erosion of upstream slope |
| ROCK SLOPE PROTECTION - RIPRAP FAILURE | No slope protection |
| UNUSUAL MOVEMENT OR CRACKING AT OR NEAR TOES | None observed |
| UNUSUAL EMBANKMENT OR DOWNSTREAM SEEPAGE | None observed |
| PIPING OR BOILS | None observed |
| FOUNDATION DRAINAGE FEATURES | No known |
| TOE DRAINS | N/A |
| INSTRUMENTATION SYSTEM | N/A |

# PERIODIC INSPECTION CHECK LIST

PROJECT: Middle Pond Dam DATE: 28 April 1981

PROJECT FEATURE: Outlet Works - Intake Channel & Intake Structure NAME: RH

DISCIPLINE: Civil Engineers NAME: DLS,RGL

| AREA EVALUATED | CONDITIONS |
|---|---|
| OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE | No intake channel or structure observed. Upstream gate on outlet works reported to be inoperable for many years. |
| A. APPROACH CHANNEL: | |
| SLOPE CONDITIONS | |
| BOTTOM CONDITIONS | |
| ROCK SLIDES OR FALLS | |
| LOG BOOM | |
| DEBRIS | |
| CONDITION OF CONCRETE LINING | |
| DRAINS OR WEEP HOLES | |
| B. INTAKE STRUCTURE: | |
| CONDITION OF CONCRETE | |
| STOP LOGS AND SLOTS | |

# PERIODIC INSPECTION CHECK LIST

PROJECT: Middle Pond Dam DATE: 28 April 1981

PROJECT FEATURE: Outlet Works - Transition and Conduit NAME: RH

DISCIPLINE: Civil Engineers NAME: DLS, RGL

| AREA EVALUATED | CONDITIONS |
|---|---|
| OUTLET WORKS - TRANSITION AND CONDUIT | 2' by 2' stone masonry conduit through right spillway partially blocked by debris. |
| GENERAL CONDITION OF CONCRETE | |
| RUST OR STAINING ON CONCRETE | |
| SPALLING | |
| EROSION OR CAVITATION | |
| CRACKING | |
| ALIGNMENT OF MONOLITHS | |
| ALIGNMENT OF JOINTS | |
| NUMBERING OF MONOLITHS | |

# PERIODIC INSPECTION CHECK LIST

PROJECT: Middle Pond Dam DATE: 28 April 1981

PROJECT FEATURE: Outlet Works - Outlet Structure & Outlet Channel NAME: RH

DISCIPLINE: Civil Engineers NAME: DLS, RGL

| AREA EVALUATED | CONDITIONS |
|---|---|
| OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL | No structure. Outlets through spillway face. |
| GENERAL CONDITION OF CONCRETE | |
| RUST OR STAINING | |
| SPALLING | |
| EROSION OR CAVITATION | |
| VISIBLE REINFORCING | |
| ANY SEEPAGE OR EFFLORESCENCE | |
| CONDITION AT JOINTS | |
| DRAIN HOLES | |
| CHANNEL | Natural stream below right spillway |
| LOOSE ROCK OR TREES OVERHANGING CHANNEL | Some trees overhanging channel |
| CONDITION OF DISCHARGE CHANNEL | Large stones from spillway weir in channel below spillway |

# PERIODIC INSPECTION CHECK LIST

PROJECT: Middle Pond Dam DATE: 28 April 1981

PROJECT FEATURE: Outlet Works - Spillway Weir, Approach and Discharge Channel NAME: RH

DISCIPLINE: Civil Engineers NAME: DLS,RGL

| AREA EVALUATED | CONDITIONS |
|---|---|
| OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS | RIGHT SPILLWAY |
| A. APPROACH CHANNEL: | |
| GENERAL CONDITION | Poor |
| LOOSE ROCK OVERHANGING CHANNEL | N/A |
| TREES OVERHANGING CHANNEL | N/A |
| FLOOR OF APPROACH CHANNEL | Channel blocked with large concrete blocks and stone rubble |
| B. WEIR AND TRAINING WALLS: | |
| GENERAL CONDITION OF CONCRETE | Stone masonry weir partially collapsed; large stones missing from crest. |
| RUST OR STAINING | N/A |
| SPALLING | N/A |
| ANY VISIBLE REINFORCING | N/A |
| ANY SEEPAGE OR EFFLORESCENCE | Seepage through open joints of stone masonry |
| DRAIN HOLES | Open joints in stone masonry |
| C. DISCHARGE CHANNEL: | |
| GENERAL CONDITION | Fair conditions; natural stream |
| LOOSE ROCK OVERHANGING CHANNEL | None observed |
| TREES OVERHANGING CHANNEL | Some trees overhanging channel |
| FLOOR OF CHANNEL | Boulders and cobbles |
| OTHER OBSTRUCTIONS | Stones from spillway weir downstream |

PROJECT: Middle Fond Dam DATE: [illegible]

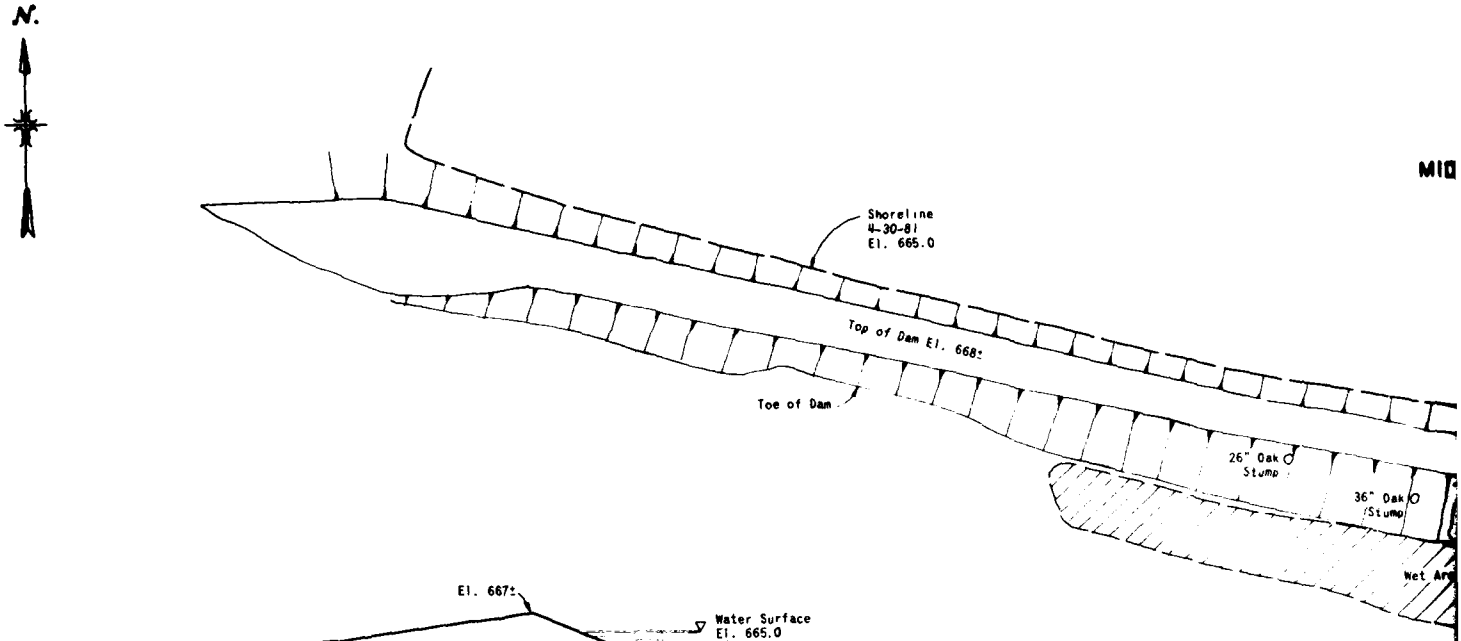
PROJECT FEATURE: Outlet Works - Spillway Weir, Approach and Discharge Channel NAME: RH

DISCIPLINE: Civil Engineers NAME: DLS,RGL

| AREA EVALUATED | CONDITIONS |
|---|---|
| OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS | LEFT SPILLWAY |
| A. APPROACH CHANNEL: | |
| GENERAL CONDITION | Fair |
| LOOSE ROCK OVERHANGING CHANNEL | N/A |
| TREES OVERHANGING CHANNEL | N/A |
| FLOOR OF APPROACH CHANNEL | Evidence of stone lining |
| B. WEIR AND TRAINING WALLS: | |
| GENERAL CONDITION OF CONCRETE | Stone masonry training walls; mortared joints at top open; joints at bottom |
| RUST OR STAINING | N/A |
| SPALLING | N/A |
| ANY VISIBLE REINFORCING | N/A |
| ANY SEEPAGE OR EFFLORESCENCE | Seepage through open joints |
| DRAIN HOLES | Open joints in stone masonry |
| C. DISCHARGE CHANNEL: | |
| GENERAL CONDITION | Fair condition; natural stream |
| LOOSE ROCK OVERHANGING CHANNEL | None observed |
| TREES OVERHANGING CHANNEL | Some trees overhanging channel |
| FLOOR OF CHANNEL | Boulders and cobbles |
| OTHER OBSTRUCTIONS | Some logs |

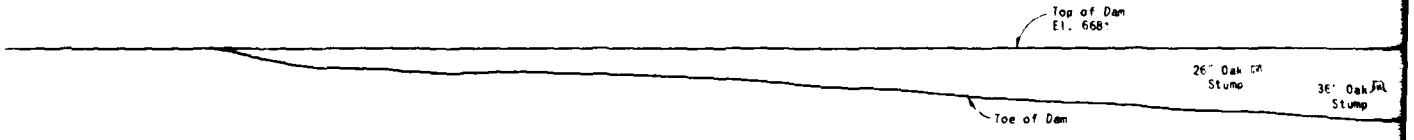
# APPENDIX B

## ENGINEERING DATA




## TYPICAL SECTION THRU DIKE

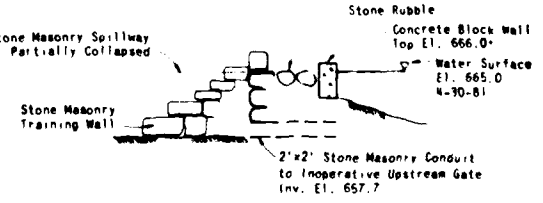
Scales: 1" = 20' Horiz. & Vert.





## SECTION C-C

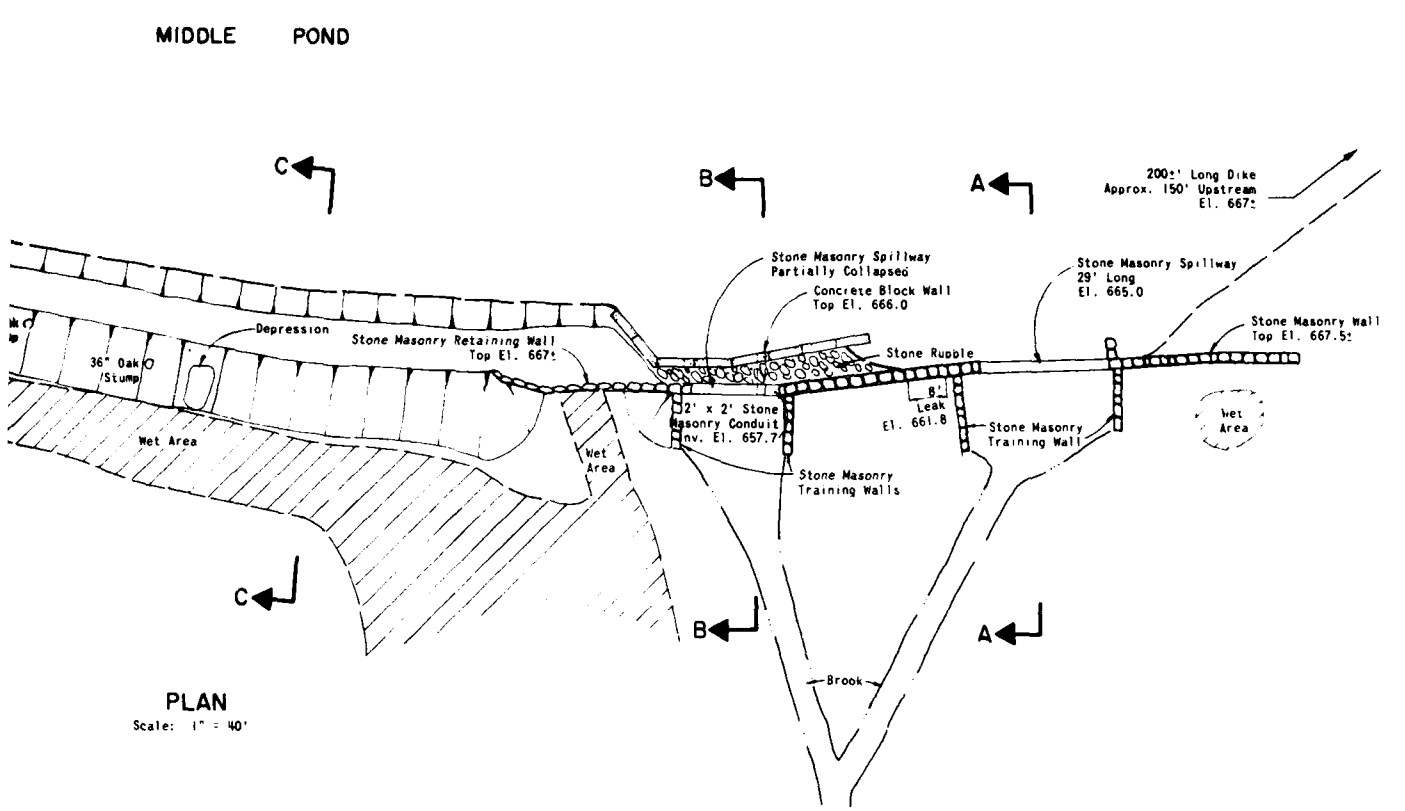
Scales: 1" = 20' Horiz. & Vert.

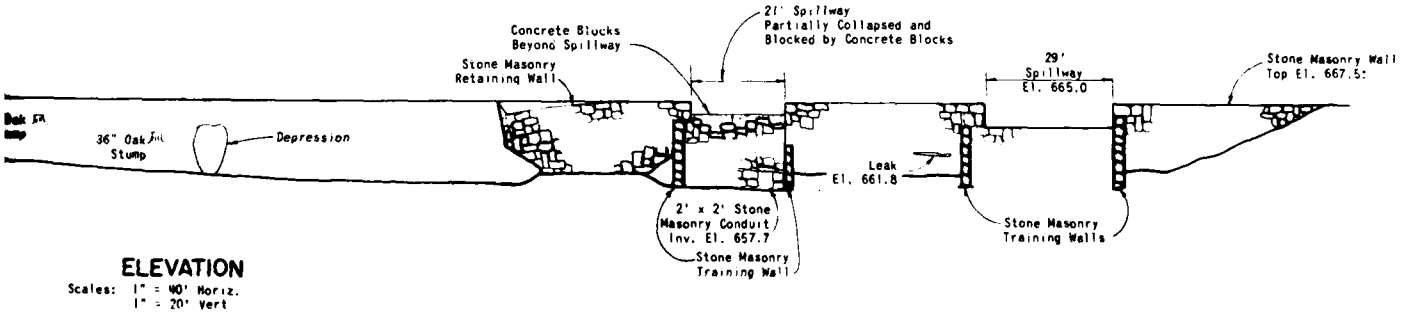


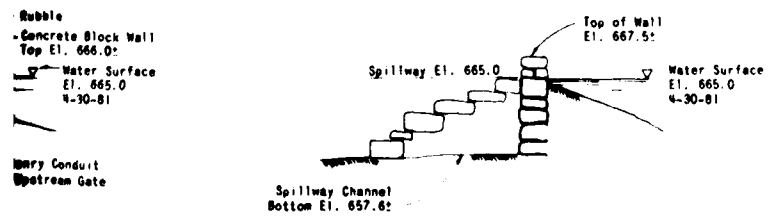

## SECTION B-B

Scales: 1" 20' Horiz. & Vert.

FIGURE 2




NOTE: THE WATER SURFACE ELEVATION SHOWN ON THE 1969 THOMASTON U.S.G.S. QUADRANGLE MAP WAS ASSUMED TO BE THE SPILLWAY CREST ELEVATION. ALL OTHER ELEVATIONS ARE BASED ON THE ASSUMED SPILLWAY CREST ELEVATION.

| ROALD HAESTAD, INC<br>*CONSULTING ENGINEERS*<br>WATERBURY, CONNECTICUT | US ARMY ENGINEER DIV NEW ENGLAND<br>*CORPS OF ENGINEERS*<br>WALTHAM, MASS |
|---|---|

NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

# MIDDLE POND DAM

| DRAWN | CHECKED | APPROVED | SCALES AS NOTED | |
|---|---|---|---|---|
| JRS | RGL | RH | DATE MAY 1981 | PAGE B-1 |

## LIST OF REFERENCES

References listed below, as well as some additional correspondence and photographs are located at the Department of Environmental Protection, Water and Related Resources Unit, State Office Building, Hartford, Connecticut 06115.

1. Correspondence between Victor Galgowski, DEP, and State Representative Arnold F. Wellman, Jr. concerning Soil Conservation Services intentions of incorporating Middle Pond into a flood control project.

2. Inspection report on Upper Pond and Middle Pond, Plymouth, Connecticut, by Charles Pelletier to Victor Galgowski, DEP, dated 9 August 1978.

3. Letter from Victor Galgowski, DEP, to Terryville Fish and Game Club, requesting repairs to Upper and Middle Pond Dams, dated 19 December 1977.

4. *Inspection report on Upper and* Middle Pond Dams by Kent A. Healy for the Terryville Fish and Game Club, dated October 4, 1977.

5. Inspection report on Middle Pond Dam by S. E. Minor & Co., Inc., Civil Engineers for DEP, dated July 15, 1974.

COPY

# STATE OF CONNECTICUT

*DEPARTMENT OF ENVIRONMENTAL PROTECTION*

STATE OFFICE BUILDING HARTFORD, CONNECTICUT 06115

COPY

16 August 1978

Hon. Arnold F. Wellman, Jr.
Box 122, 19 Dewey Avenue
Terryville, Connecticut

Re: Upper Pond Dam & Middle Pond Dam
Plymouth

Dear Representative Wellman:

Pursuant to your recent request, Charles Pelletier, a highly qualified engineering consultant to our unit, reinspected the subject dams. In general, he concurred with the findings of the engineer retained by the Terryville Fish and Game Club.

Additional deficiencies noted by Mr. Pelletier include:

Upper Pond Dam

Training walls at each end of the spillway are in poor condition and should be repaired. A low point where the pond adjoins the road about 600 feet from the dam should be filled.

Middle Pond Dam

Low areas approximately 100 feet and 200 feet easterly from the easterly spillway should be filled.

Since failure of these structures could cause damage, the work indicated by the club's engineer and our consultant will need to completed or the dams breached, as provided by state statutes. However, since there is a possibility that these sites may be incorporated into a flood control project for the entire area, we feel repairs can be delayed until the Soil Conservation Service submits their report.

Very truly yours,

Victor F. Galgowski
Supt. of Dam Maintenance
Water Resources Unit
Telephone no. 566-7245

VFG:ljk

cc: Edward Pomianowski, Secretary
Terryville Fish and Game Club

★ THINK CASH! Send in a suggestion. You could win an award! ★
Send your suggestion to: Employees' Suggestion Awards Program, 165 Capitol Ave., Hartford, 06115.

**Interdepartment Message**

S [illegible]-201 REV. 3/77 STATE OF CONNECTICUT
([illegible]ch No. 6938-051-01)

SAVE TIME: *Handwritten messages are acceptable.*
*Use carbon if you really need a copy. If typewritten, ignore faint lines.*

| | | | |
|---|---|---|---|
| **To** | NAME: Victor F. Galgowski | TITLE: Supt. of Dam Maintenance | DATE: 9 August 1978 |
| | AGENCY: Environmental Protection | ADDRESS: | |
| **From** | NAME: Charles J. Pelletier | TITLE: Consultant | TELEPHONE: |
| | AGENCY: Environmental Protection | ADDRESS: | |

SUBJECT

P-3, Upper Pond and P-12, Middle Pond - Plymouth

These two dams were inspected on August 9, 1978.

The condition of the dams is substantially as described in a letter report to the Terryville Fish and Game Club prepared by Kent A. Healy, Sc.D.

In addition to the material in that report, I note that at dam P-3 the training walls at each end of the spillway are in poor condition and should be repaired. Some stones have fallen out of the easterly wall. There is also a second low point at which overflow can occur, at the point where the pond adjoins the road about 600 feet north from the dam.

At P-12 there are also two areas of low freeboard about 100 feet and 200 feet easterly from the easterly spillway.

Concerning possible hazard downstream, there is a dwelling at a low elevation on the left bank about 600 feet east from the dam which would probably be flooded in the walkout basement should dam P-12 fail. The entrance road to an apartment complex and the parking lot about 900 feet downstream would probably be flooded. Flow might cross the road into a residential lot about 200 feet south from Route 6. However, the probability of such a failure is small given the type of construction of dam P-12.

[signature]
Water Resources Unit

CJP:ljk

★

SAVE TIME: *If convenient, handwrite reply to sender on this same sheet.*

8-9-78

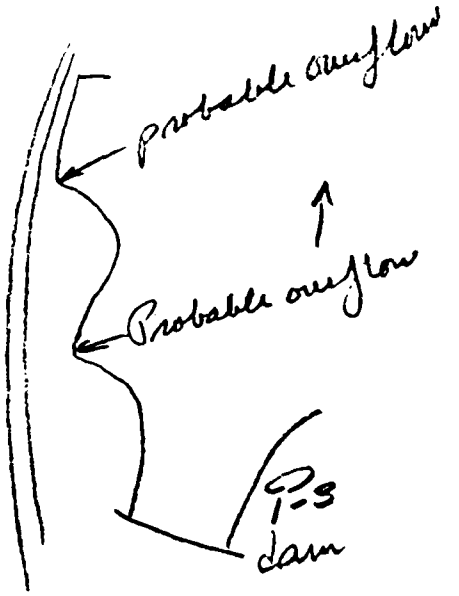
Plymouth - 3

Masonry Training walls at spillway are in need of repair

2 Low areas on west side - one at south end & left and one where the pond abuts the road. 2.32 □mi DA

Plymouth 12

2 low areas 100' and 200' east from easterly Spillway. 3.73 □mi DA.



# State of Connecticut

HOUSE OF REPRESENTATIVES
STATE CAPITOL
HARTFORD, CONNECTICUT 06115

ARNOLD F. WELLMAN, JR.
SEVENTY-SIXTH DISTRICT

BOX 122, 19 DEWEY AVENUE
TERRYVILLE, CONN. 06786

HOME 589-3472
OFFICE: 589-2017
CAPITOL: 566-4319

SERVING THE PEOPLE OF
WATERBURY (NORTH END)
PLYMOUTH TERRYVILLE
PEQUABUCK

August 1, 1978

WATER RESOURCES
UNIT
RECEIVED
AUG 8 1978
ANSWERED
REFERRED
FILED

Mr. Victor Golgowski
Supt. of Dam Maint.
Water Resource Unit, D.E.P.
State Office Building
Hartford, Conn.

Dear Vic:

As per our conversation of August 1, I would respectfully request your Department reevaluate the mandate to repair dams on the upper and middle ponds owned by Terryville Fish & Game Club.

Correspondence from your Department, dated December 19, 1977, mandated a submission requirement for initial plans, of March 1, 1977, and total work completion achieved by January 1, 1979. My office has been involved for the past year and one-half, in a full-scale flood control proposal with the Soil Conservation Services and your Water Resources Unit. The SCS is in the process of rendering a decision as to their formal committment to the entire area, which includes the upper and middle ponds.

Further, inasmuch as the Club does not have the financial resources at this time, to complete the requirements of the Commissioner's order, I would request that such be closely evaluated, as to a compatible resolution of the problem.

Sincerely,

Arnold F. Wellman, Jr.
State Representative
76th Assembly District

AFW/erw

cc: Ms. Kim Nielson
Mr. Edward Pomianowski

COPY

# STATE OF CONNECTICUT

*DEPARTMENT OF ENVIRONMENTAL PROTECTION*

STATE OFFICE BUILDING HARTFORD, CONNECTICUT 06115

COPY

19 December 1977

Mr. Edward Pomianowski, Secretary
Terryville Fish and Game Club
19 Grove Street
Terryville, Connecticut 06786

Re: Upper Pond Dam
Middle Pond Dam
Plymouth

Dear Mr. Pomianowski:

Thank you for the inspection report prepared by your engineer for the two referenced dams.

In general, we concur with his findings as to the necessity for maintenance and repair work at both sites. However, we cannot agree with his statement to the effect that Middle River does not pose a hazard downstream.

Since either of these dams could endanger life or property by failing, they fall under the jurisdiction of the Commissioner of the Department of Environmental Protection. According to state statutes, the Commissioner is authorized to order the owner of a dam to make repairs necessary to place the dam in a safe condition or to remove it. Before anyone undertakes repairs or removal, he must apply for a permit to undertake the work. The permit is issued by this Department upon receipt and approval of engineering plans and specifications prepared by an engineer registered in the State of Connecticut.

If it is your decision to continue use of the dams, please submit plans for the necessary repairs. The construction should include, but is not necessarily limited to the following:

Upper Pond

1. The earthen dike be filled to allow at least three feet of freeboard.

2. Make draw down facility operable.

Middle Pond

1. Replace missing stones and reinforce west spillway.

2. Repair stonewall and replace fill.

Mr. Edward Pomianowski, Secretary
Terryville Fish and Game Club
19 Grove Street
Terryville, Connecticut 06786



In addition, the trees and brush at both sites must be cut and removed.

Engineering plans should be submitted for our review by March 1, 1978 and the work completed by January 1, 1979.

Very truly yours,

Victor F. Galgowski
Supt. of Dam Maintenance
Water Resources Unit
Telephone no. 566-7245

VFG:ljk

KENT A. HEALY Sc.D.
SOILS AND FOUNDATION ENGINEERING
RTE. 198
CHAPLIN, CONNECTICUT 06235
455-9073

October 4, 1977

Terryville Fish & Game Club
c/o Joseph Szulkowski
3 Joseph St.
Terryville, Conn. 06786

Gentlemen:

On September 27, 1977, at the request of Mr. Joseph Szulkowski, I inspected the Upper Pond and Middle Pond dams in Terryville, Conn. This letter is my report to you on the condition of these two dams, the hazard due to these dams, and reccommendations for repairs and maintenance.

Upper Pond

The Upper Pond is impounded by an earth dike on the west and a stonewall-earth dam on the south. The stone spillway in the dam is approximately 35 feet wide and 2.5 feet deep, and is in excellent condition. The dam is about 16 feet high at the spillway and there is an outlet works at the base of the spillway that is apparently inoperable.

There is a 10 foot long section of the dike, about 300 feet north of the dam that has about 1.5 feet of freboard and is only 5 feet wide. The rest of the dike is considerably higher and wider. There is some erosion of the earth fill behind the stonewall dam.

A hydrologic study of the pond indicates that the mean annual flood flow is about 90 cfs whereas the capacity of the spillway is approximately 550 cfs. The dam will rarely be overtopped. The primary hazard from this dam is the possibility that the low section of the earth dike will be overtopped during a storm, and the road below will be flooded. The water would probably not be released rapidly enough to cause damage other than to the road.

I reccomend that the earth dike be cut free of brush and trees, and that it be filled to a height at least 3 feet above the spillway elevation and be at least 10 feet wide at the top. Some additional fill should be placed on the dam behind the stone wall. All the trees within 10 feet of the stonewall dam should be cut, and the condition of the outlet works should be determined to see if repairs are neccessary.

Middle Pond

The Middle Pond is also impounded by an earthdike on the west and a stonewall-earth dam on the south. The dam is about 7 feet high. There are two stone spillways in the dam. The west one is approximately 25 feet wide and 3 feet deep, and is badly deteriorated with several large stones missing. The east one

KENT A. HEALY Sc.D.
SOILS AND FOUNDATION ENGINEERING
RTE. 198
CHAPLIN, CONNECTICUT 06235
455-9073

Oct. 4, 1977

is 20 feet wide and 2.5 feet deep and is in very good condition. The embankment on both ends of the dam and between the spillways is in poor condition due to erosion of the earth behind the stone wall. The earth dike on the west side of the pond has about 3.5 feet of freeboard and is about 15 feet wide on top, but has many large trees growing on it.

There is no significant hazard downstream due to this pond, however the dam and the west spillway will continue to erode and the pond level will gradually drop.

I reccomend that the brush and trees on the earth dike be cut down and the roots left in place. The stonewall of the dam should be repaired and new fill placed behind it if the pond level is to be maintained. All trees within 10 feet of the stone wall dam should be cut down.

If you have any questions, please let me know.

Yours truly, Kent A. Healy

Kent A. Healy P.E. Conn. 06586

Report and Recommendations
to
State of Connecticut
Department of Environmental Protection
for
Middle Pond Dam
Plymouth, Connecticut

869-0136

ESTABLISHED 1887

S. E. MINOR & CO., INC.
CIVIL ENGINEERS
181 MASON STREET
GREENWICH, CONNECTICUT 06830

July 15, 1974

State of Connecticut
Department of Environmental Protection
State Office Building
Hartford, Connecticut 06115

Attention: Mr. Victor F. Galgowski
Superintendent of Dam Maintenance
Water and Related Resources

Re: Middle Pond Dam
Plymouth, Connecticut

Dear Mr. Galgowski:

In accordance with your request, we have examined the subject dam in order to ascertain its structural soundness and stability. Prior to our visit to the site, we went to the Town Hall offices and attempted to obtain any structural drawings of the subject installation. We were advised that no plans were on file and that the Town Officials had no knowledge whatsoever of the construction of the dam.

Upon visiting the site, we examined the structure, which consists of an earth dam held by a dry rubble retaining wall. A short distance back from the spillway (approximately ten feet) the earth dam is 15 feet wide on the top. The spillway consists of a rubble wall approximately four feet, six inches thick and 30 feet in length. It has a vertical face with a drop of approximately eight feet. The total length of the stone retaining wall is approximately 100 feet.

We have taken photos of the dam, which are submitted as a part of this report. On the reverse side of the photos we have indicated numbers, which we may refer to from time to time.

It is our considered opinion, as a result of our observation, that the dam is structurally sound and stable. There is approximately three feet of freeboard, and our investigation revealed no evidence of any overtopping. The spillway contains cheek walls on the easterly and westerly extremities. Both of these walls need rechinking, as may be evidenced in Photo No. 2. In Photos No. 1 and 2 it may be seen that the westerly abutment of the dam also needs chinking. Photo No. 3 was taken close-up of some of the joints at the leading edge of the face of the dam. It may be seen that the joints

between the riprap have eroded; and as a result, a few of the stones in the vertical face of the dam have fallen out. Any such stones should be replaced; and the severe openings, as evidenced in Photo No. 3, should be rechinked and pointed. The lake bottom immediately behind the dam has a very shallow slope toward the center of the lake. There was no evidence of leaks or boils coming through the earth section of the dam.

It is our considered opinion that the dam is structurally sound but that the aforementioned maintenance steps should be taken in the very near future to prevent further deterioration.

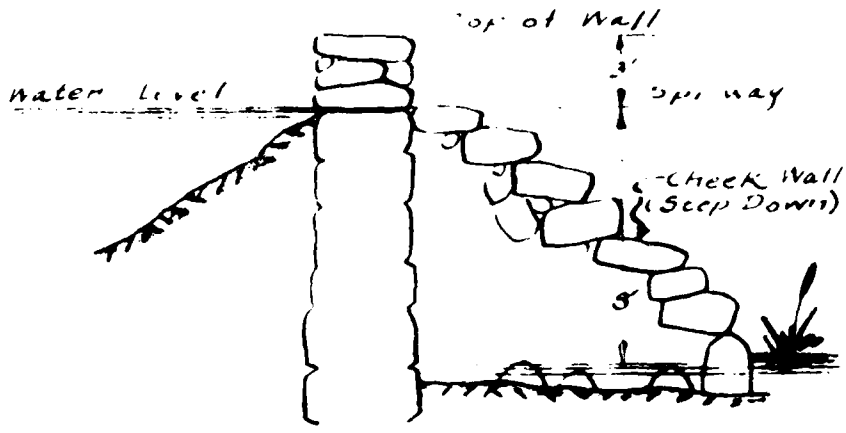
Respectfully submitted,

S. E. MINOR & CO., INC.

Edw. F. Ahneman Jr.

Edward F. Ahneman, Jr.
Chief Engineer

EFA:lb




SECTION

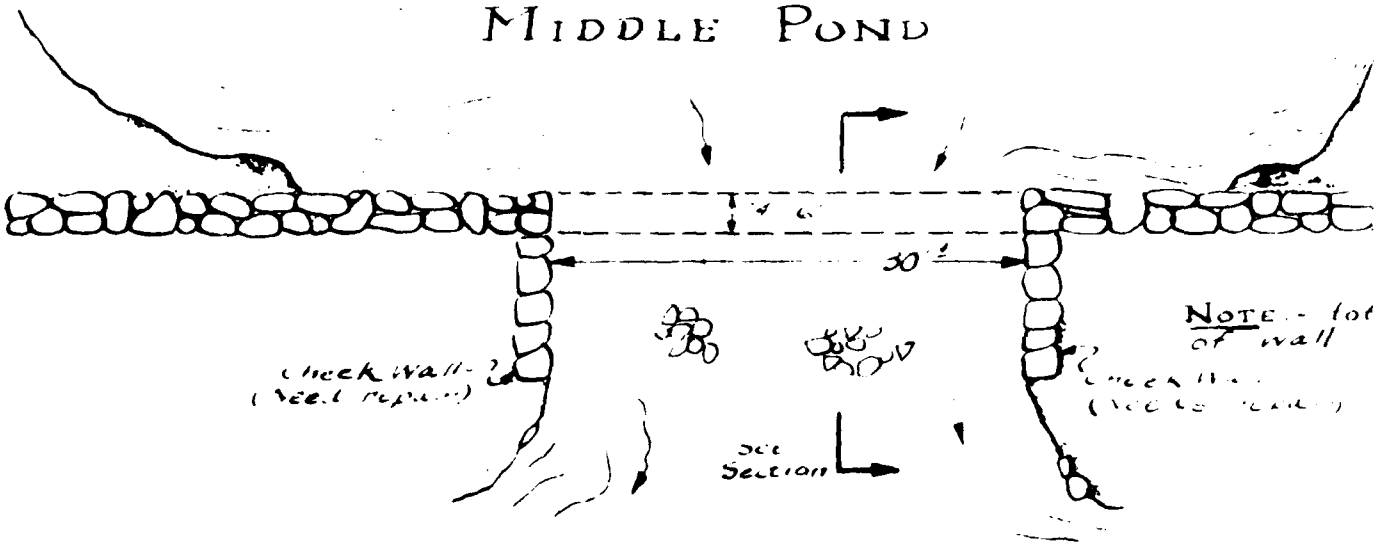
No Scale

NOT TO SCALE

# SKETCH OF
# MIDDLE POND DAM
## PLYMOUTH, CONN

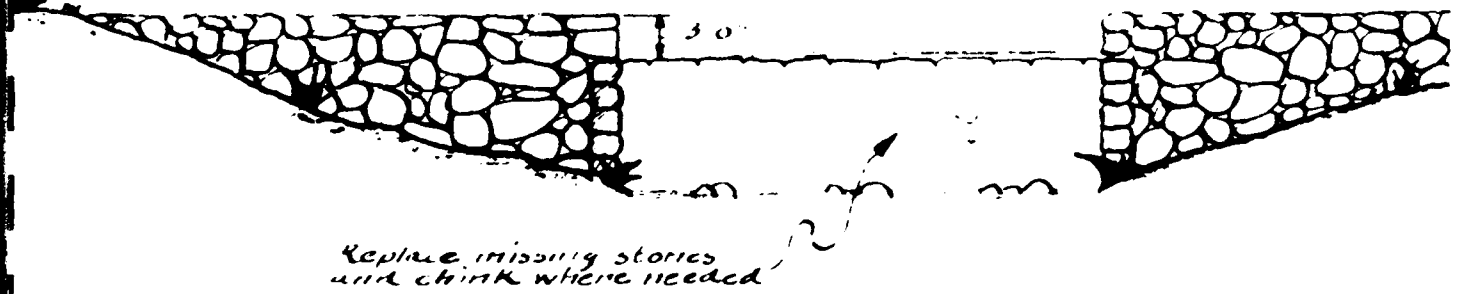
COMPARED

# MIDDLE POND




## PLAN

Scale: 1/8" = 1'-0"




## ELEVATION

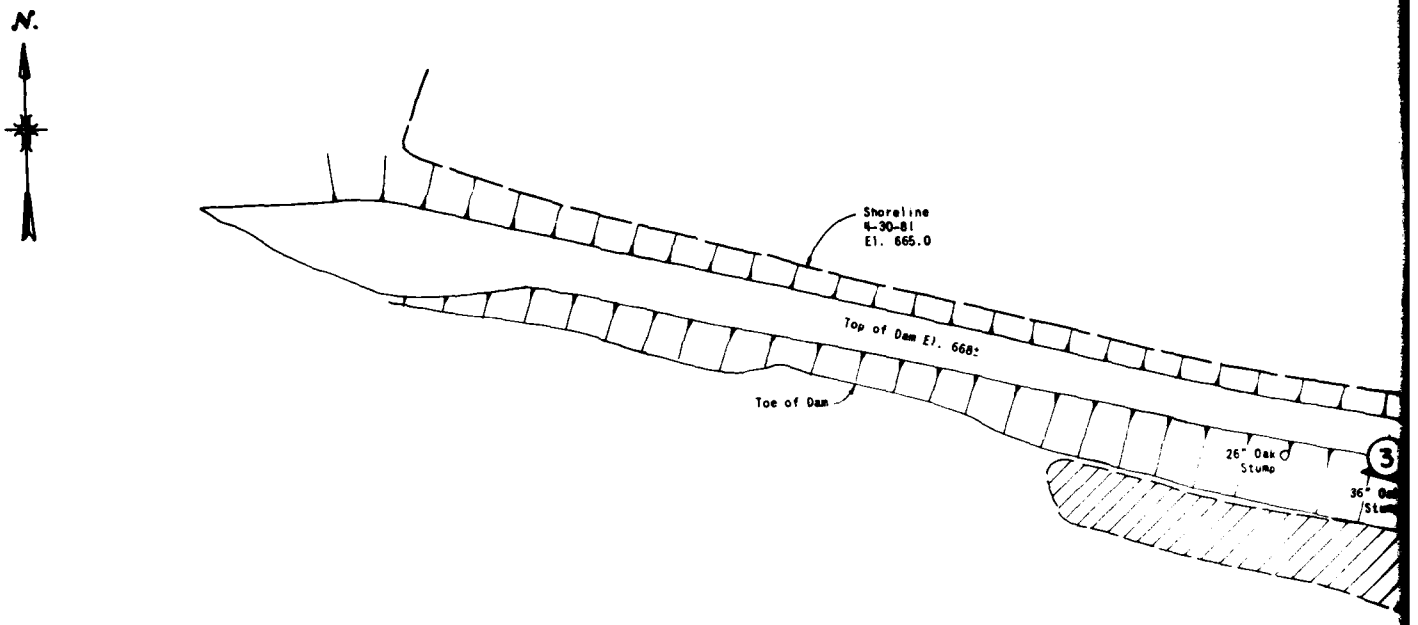
Scale: 1/8" = 1'-0"

R & CO., INC. CIVIL ENGINEERS
H. CONN. 06-2 2918-4

SCALE: As Noted

# APPENDIX C

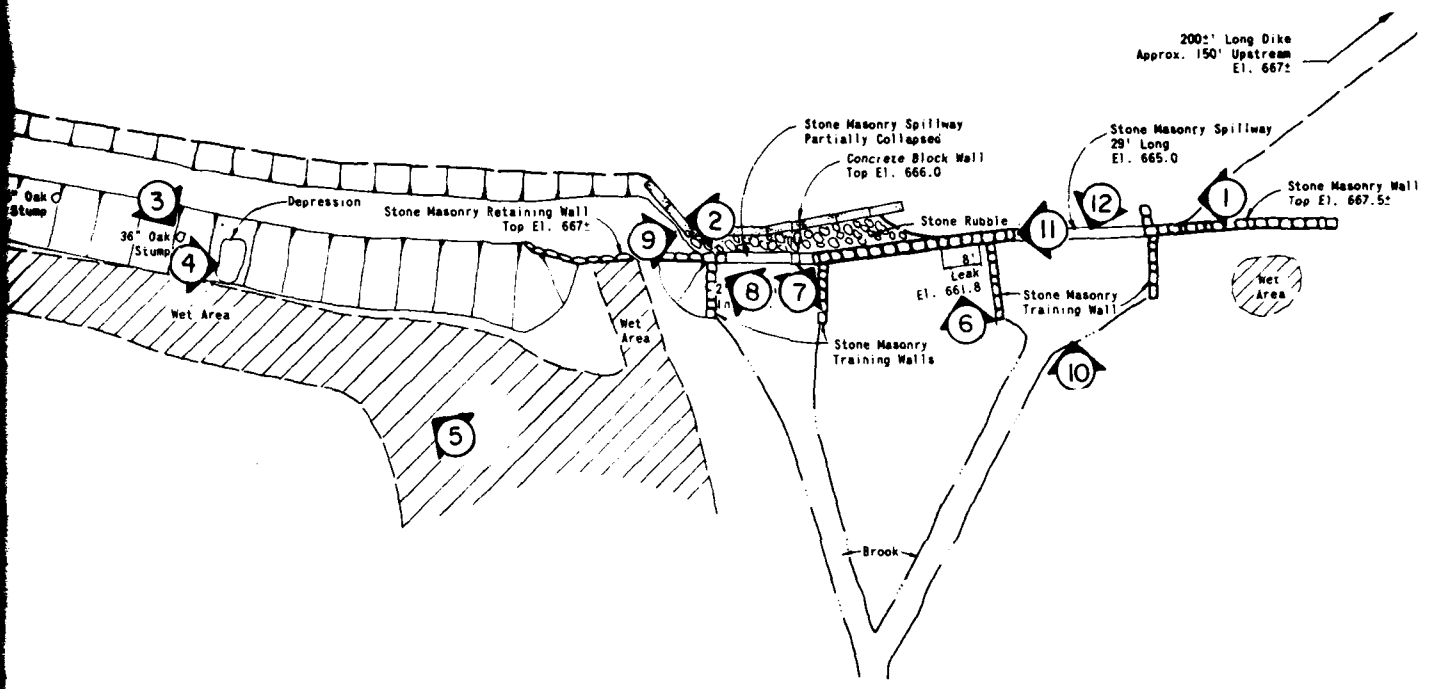
## PHOTOGRAPHS




Denotes photo number and direction in which photo was taken

FIGURE 3

MIDDLE POND




| ROALD HAESTAD, INC. CONSULTING ENGINEERS WATERBURY, CONNECTICUT | US ARMY ENGINEER DIV NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS |
|---|---|

NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

PHOTO LOCATION PLAN
MIDDLE POND DAM
PLYMOUTH, CONNECTICUT

| DRAWN | CHECKED | APPROVED | SCALES | 1" = 40' |
|---|---|---|---|---|
| JRS | RGL | RH | DATE 5/81 | PAGE C-1 |

PHOTO NO. 1

DAM FROM LEFT ABUTMENT. NOTE LACK OF EARTH EMBANKMENT UPSTREAM OF STONE MASONRY WALL IN FOREGROUND AND CONCRETE BLOCKS UPSTREAM OF RIGHT SPILLWAY IN BACKGROUND.

PHOTO NO. 2

DAM CREST FROM RIGHT SPILLWAY. NOTE IRREGULARITY OF CREST AND BRUSH ON UPSTREAM AND DOWNSTREAM SLOPES.

| | | |
|---|---|---|
| U.S.ARMY ENGINEER DIV. NEW ENGLAND<br>CORPS OF ENGINEERS<br>WALTHAM, MASSACHUSETTS | NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS | MIDDLE POND DAM<br>PEQUABUCK RIVER<br>PLYMOUTH, CONNECTICUT<br>CT 00283<br>28 APRIL 1981 |
| ROALD HAESTAD, INC.<br>CONSULTING ENGINEERS<br>WATERBURY, CONNECTICUT | | |

PHOTO NO. 3

CUT BRUSH AND 36" DIAMETER TREE
STUMP ON DOWNSTREAM SLOPE.

PHOTO NO. 4

5' DIAMETER DEPRESSION COVERED WITH CUT BRUSH.

| | | |
|---|---|---|
| U.S ARMY ENGINEER DIV. NEW ENGLAND<br>CORPS OF ENGINEERS<br>WALTHAM, MASSACHUSETTS | NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS | MIDDLE POND DAM<br>PEQUABUCK RIVER<br>PLYMOUTH, CONNECTICUT<br>CT 00283<br>28 APRIL 1981 |
| ROALD HAESTAD, INC.<br>CONSULTING ENGINEERS<br>WATERBURY, CONNECTICUT | | |

PHOTO NO. 5

WET AREA DOWNSTREAM OF DAM.
NOTE MOISTURE-LOVING VEGETATION.

PHOTO NO. 6

LEAKAGE THROUGH DOWNSTREAM STONE MASONRY
WALL BETWEEN SPILLWAYS. RULE EXTENDED 32 INCHES.

| | | |
|---|---|---|
| U.S ARMY ENGINEER DIV. NEW ENGLAND<br>CORPS OF ENGINEERS<br>WALTHAM, MASSACHUSETTS | NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS | MIDDLE POND DAM<br>PEQUABUCK RIVER<br>PLYMOUTH, CONNECTICUT<br>CT 00283<br>28 APRIL 1981 |
| ROALD HAESTAD, INC.<br>CONSULTING ENGINEERS<br>WATERBURY, CONNECTICUT | | |

PHOTO NO. 7

LEFT END OF RIGHT SPILLWAY. NOTE LEANING OF
STONE MASONRY WALL AND MISSING STONES AT SPILLWAY CREST

PHOTO NO. 8

RIGHT END OF RIGHT SPILLWAY
NOTE MISSING STONES AT SPILLWAY CREST

| | | |
|---|---|---|
| U.S.ARMY ENGINEER DIV. NEW ENGLAND<br>CORPS OF ENGINEERS<br>WALTHAM, MASSACHUSETTS | NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS | MIDDLE POND DAM<br>PEQUABUCK RIVER<br>PLYMOUTH, CONNECTICUT<br>CT 00283<br>28 APRIL 1981 |
| ROALD HAESTAD, INC.<br>CONSULTING ENGINEERS<br>WATERBURY, CONNECTICUT | | |

PHOTO NO. 9

RIGHT SPILLWAY
NOTE CONCRETE BLOCKS AND STONE RUBBLE BLOCKING SPILLWAY

PHOTO NO. 10

LEFT SPILLWAY FROM DOWNSTREAM

| | | |
|---|---|---|
| U.S ARMY ENGINEER DIV. NEW ENGLAND<br>CORPS OF ENGINEERS<br>WALTHAM, MASSACHUSETTS | NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS | MIDDLE POND DAM<br>PEQUABUCK RIVER<br>PLYMOUTH, CONNECTICUT<br>CT 00283<br>28 APRIL 1981 |
| ROALD HAESTAD, INC.<br>CONSULTING ENGINEERS<br>WATERBURY, CONNECTICUT | | |

PHOTO NO. 11

RIGHT END OF LEFT SPILLWAY
NOTE LACK OF EMBANKMENT UPSTREAM OF STONE MASONRY WALL

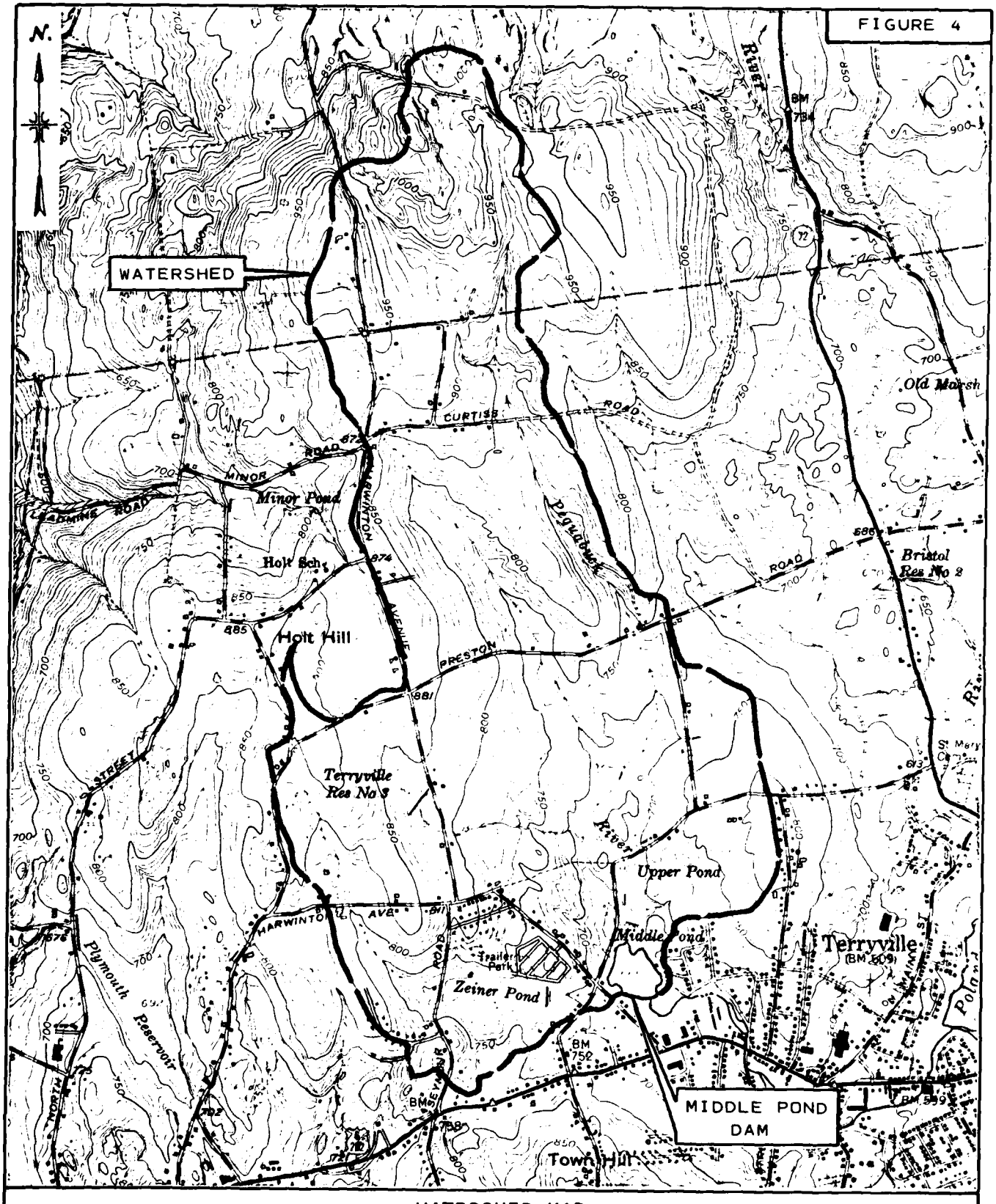
PHOTO NO. 12
NATURAL CHANNEL BELOW LEFT SPILLWAY
NOTE LOGS IN AND ACROSS CHANNEL

| | | |
|---|---|---|
| U.S ARMY ENGINEER DIV NEW ENGLAND<br>CORPS OF ENGINEERS<br>WALTHAM, MASSACHUSETTS | NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS | MIDDLE POND DAM<br>PEQUABUCK RIVER<br>PLYMOUTH, CONNECTICUT<br>CT 00283<br>28 APRIL 1981 |
| ROALD HAESTAD, INC.<br>CONSULTING ENGINEERS<br>WATERBURY, CONNECTICUT | | |

# APPENDIX D

## HYDROLOGIC AND HYDRAULIC COMPUTATIONS

FIGURE 4




WATERSHED MAP

MIDDLE POND DAM
PLYMOUTH, CONNECTICUT

SCALE: 1" = 2000'

ROALD HAESTAD, INC.

THOMASTON QUADRANGLE 1969

BY SAL DATE 5/27/81 **ROALD HAESTAD, INC.** SHEET NO 1 OF 1

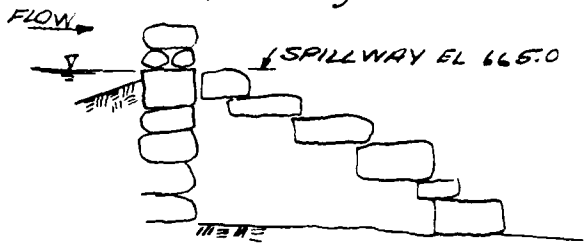
CONSULTING ENGINEERS

CKD BY DLS DATE 5/27/81 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 49-042

SUBJECT MIDDLE POND DAM - Project discharge capacity

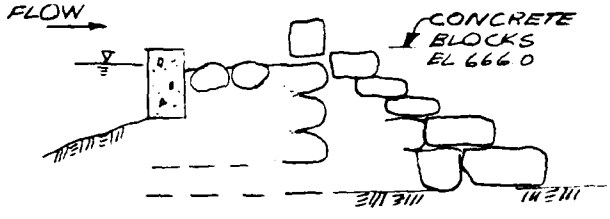
Spillway Sections: Scale: 1"=10' Horiz. & Vert.

Left Spillway



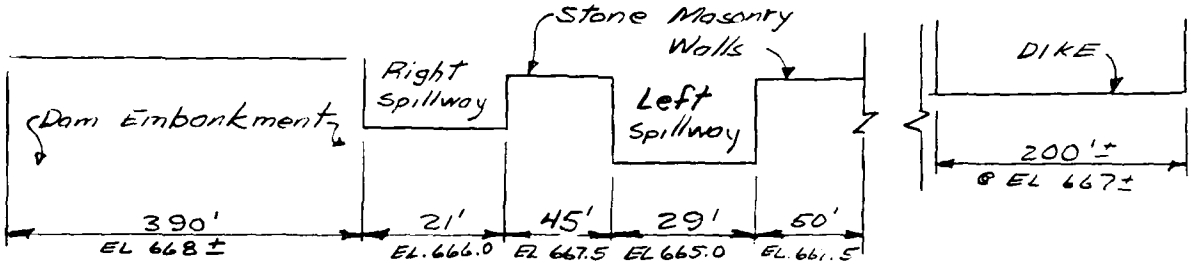

L = 29' C = 2.8

Right Spillway




L = 21' C = 2.8

Dam & Dike Profile:




Stone Masonry Wall discharge coeff. = 2.7
Dam Embankment " " = 2.7
Dike " " = 2.9

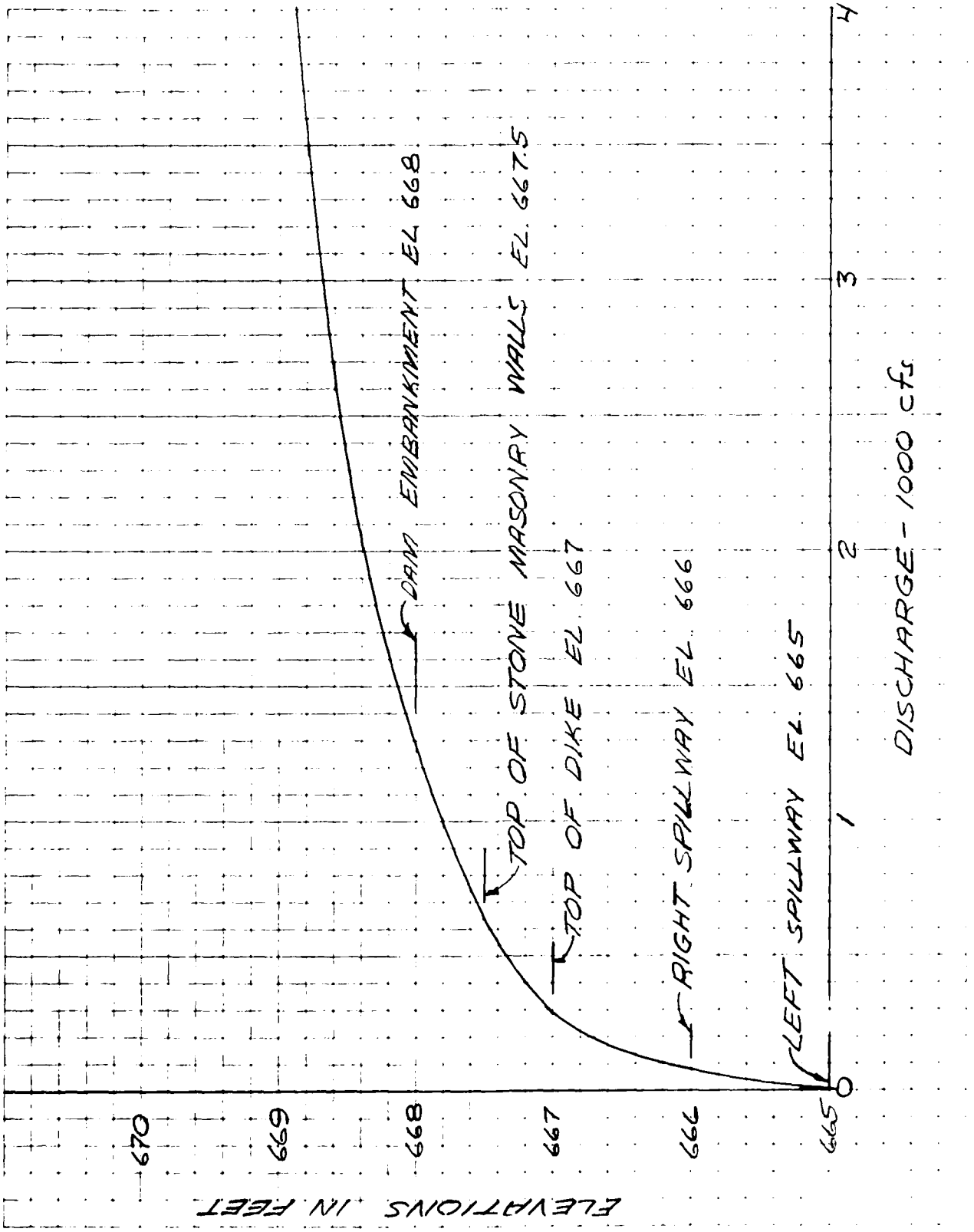
| ELEV. (feet) | Left Spillway (cfs) | Right Spillway (cfs) | Stone Mas. Walls (cfs) | Dike (cfs) | Dam Embankment (cfs) | Total Disch Capacity (cfs) |
|---|---|---|---|---|---|---|
| 665 | 0 | 0 | 0 | 0 | 0 | 0 |
| 666 | 81 | 0 | 0 | 0 | 0 | 81 |
| 667 | 230 | 59 | 0 | 0 | 0 | 289 |
| 667.5 | 321 | 108 | 0 | 205 | 0 | 634 |
| 668 | 422 | 166 | 91 | 580 | 0 | 1259 |
| 669 | 650 | 306 | 471 | 2293 | 1053 | 4773 |
| 670 | 908 | 470 | 1014 | 3014 | 2978 | 8384 |

BY SAL DATE 5/28/81 **ROALD HAESTAD, INC.** SHEET NO 5 OF 21

CONSULTING ENGINEERS

CKD BY DLS DATE 5/28/81 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 49-042

SUBJECT MIDDLE POND DAM - Project discharge capacity curve



BY SAL DATE 4/16/81 **ROALD HAESTAD, INC.** SHEET NO 3 OF 21

CONSULTING ENGINEERS

CKD BY [illegible] DATE 5/21/81 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 49-042

SUBJECT MIDDLE POND DAM - Surcharge storage capacity

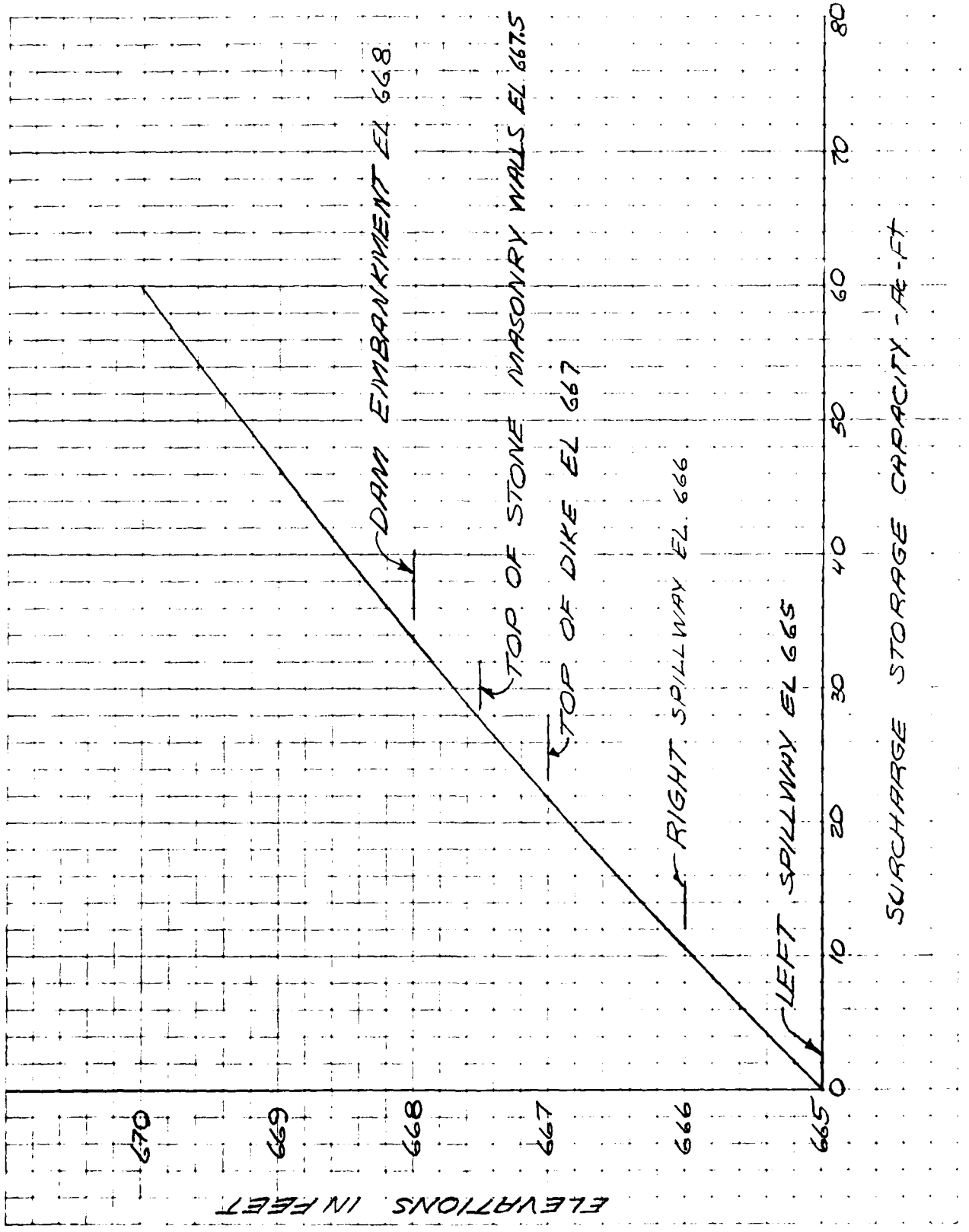
| Elev. (Feet) | Surface Area (Acres) | Average Surface Area (Acres) | Surcharge Storage Cap. (Acre-Ft) |
|---|---|---|---|
| 665 | 10.1 | | 0 |
| | | 10.45 | |
| 666 | 10.8 | | 10.5 |
| | | 11.20 | |
| 667 | 11.6 | | 21.7 |
| | | 11.95 | |
| 668 | 12.3 | | 33.6 |
| | | 12.70 | |
| 669 | 13.1 | | 46.3 |
| | | 13.45 | |
| 670 | 13.8 | | 59.8 |

BY SAL DATE 5/28/81 **ROALD HAESTAD, INC.** SHEET NO 1 OF 21

CONSULTING ENGINEERS

CKD BY DLS DATE 5/28/81 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 49-042

SUBJECT MIDDLE POND DAM - Surcharge storage capacity curve



BY SAA DATE 5/28/81 **ROALD HAESTAD, INC.** SHEET NO 5 OF 21
CONSULTING ENGINEERS
CKD BY [illegible] DATE 5/28/81 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 49-042
SUBJECT MIDDLE POND DAM - Test Flood

TEST FLOOD = ½ PMF

Drainage Area = 1,538 Acres = 2.4 sq mi.

From Corps of Eng. chart for "ROLLING" Terrain

MPF = 2,075 cfs/sq mi (For 2.4 sq. mi. Watershed)

PMF = 2,075 cfs/sq mi. × 2.4 sq mi = 4,980 cfs

½ PMF = ½ (4,980) = 2,490 cfs

$Q_{P1}$ = 2,490 cfs

$H_1$ = 3.6 ft above east spillway, From Discharge Capacity Curve

$STOR_1$ = 41 Ac-Ft, from Storage Capacity Curve

= 0.32" of runoff from 2.4 sq.mi.

Note: The storage capacity at Middle Pond Dam is negligible compared to the rainfall-runoff, therefore the outflow is essentially equal to the inflow.

Spillways Discharge Capacity = 429 cfs
(Top of Stone Masonry Walls with Right Spillway partially blocked)

% of ½ PMF = (429/2490) × 100 = 17% of ½ PMF

Spillways Discharge Capacity = $2.8(21+29)(2.5)^{3/2}$
(Top of Stone Masonry Walls with Right Spillway same elevation as Left Spillway) = 553 cfs

% of ½ PMF = (553/2490) × 100 = 22% of ½ PMF

S = Storage at Time of failure with water level at top of dam.

S = Storage at spillway level + Surcharge storage

S = (Surface Area x Ave. depth) + Surcharge storage

S = (10.1 Acres x 3 feet (Estimated)) + 33.6 Ac-Ft (From surcharge storage capacity curve)

S = 30.3 Ac-Ft + 33.6 Ac-Ft

S = 63.9 use 65 Ac-Ft.

$Q_{pl}$ = Peak Failure Outflow = $\frac{8}{27} W_b \sqrt{g}\, Y_o^{3/2}$

$W_b$ = Breach width - 20% of dam length across river at mid-height = 0.2 (350) = 70

$Y_o$ = Total height from river bed to pool level at Time of failure = 10 feet

$Q_{pl} = \frac{8}{27} (70)(\sqrt{32.2})(10)^{3/2}$

= 3,721.8 use 3,700 cfs

Dike Discharge Capacity (At top of dam) = $CLH^{3/2} = 2.9(200)(0.5)^{3/2}$

= 205 cfs

Total Outflow = 3,700 + 205 = 3905 use <u>3,900</u> cfs

Flow in channel prior to dam failure:

Q = Right Spillway + Left Spillway + Dike

$Q = 2.8(21)(1.5)^{3/2} + 2.8(29)(2.5)^{3/2} + 2.9(200)(0.5)^{3/2}$

Q = 634 use 635 cfs

BY SAL DATE 5/27/81 ROALD HAESTAD, INC. SHEET NO 1 OF 21

CKD BY DLS DATE 5/28/81 CONSULTING ENGINEERS JOB NO. 049 042

SUBJECT MIDDLE POND DAM-FLOOD ROUTING AT TOP OF DAM

SECTION NUMBER 1

PLYM. VILLAGE APTS
(STORAGE CAPACITY WITHIN REACH)

| HEIGHT (FEET) | SURFACE AREA (ACRES) | STORAGE VOLUME (ACRE-FEET) |
|---|---|---|
| 1.0 | 0.65 | 0.3 |
| 2.0 | 1.30 | 1.3 |
| 3.0 | 1.95 | 2.9 |
| 4.0 | 2.60 | 5.2 |
| 5.0 | 3.25 | 8.1 |
| 6.0 | 3.90 | 11.7 |
| 7.0 | 4.55 | 15.9 |
| 8.0 | 5.20 | 20.8 |
| 9.0 | 5.85 | 26.3 |
| 10.0 | 6.50 | 32.5 |
| 11.0 | 9.16 | 40.3 |
| 12.0 | 11.82 | 50.8 |
| 13.0 | 14.48 | 64.0 |
| 14.0 | 17.14 | 79.8 |

STORAGE CAPACITY CALCULATED FROM SURFACE AREAS AT KNOWN ELEVATIONS.

BY SAL DATE 5/27/81 ROALD HAESTAD, INC. SHEET NO 8 OF 21

CKD BY DLS DATE 5/28/81 CONSULTING ENGINEERS JOB NO. 049 042

SUBJECT MIDDLE POND DAM-FLOOD ROUTING AT TOP OF DAM

SECTION NUMBER 1

PLYM. VILLAGE APTS

| HEIGHT ABOVE INVERT (FEET) | D I S C H A R G E C A P A C I T Y CONDUIT (CFS) | SPILLWAY (CFS) | TOTAL (CFS) |
|---|---|---|---|
| 1.0 | 42 | 0 | 42 |
| 2.0 | 85 | 0 | 85 |
| 3.0 | 170 | 0 | 170 |
| 4.0 | 254 | 0 | 254 |
| 5.0 | 355 | 0 | 355 |
| 6.0 | 456 | 0 | 456 |
| 7.0 | 546 | 0 | 546 |
| 8.0 | 636 | 0 | 636 |
| 9.0 | 715 | 288 | 1003 |
| 10.0 | 795 | 813 | 1608 |
| 11.0 | 853 | 1744 | 2597 |
| 12.0 | 912 | 3007 | 3919 |
| 13.0 | 970 | 4588 | 5558 |
| 14.0 | 1028 | 6438 | 7466 |

STORAGE AT TIME OF FAILURE=S= 65 AC. FT.

LENGTH OF REACH=L= 1200 FT

INFLOW INTO REACH=QP1= 3900 CFS

BY SAL DATE 5/27/81 ROALD HAESTAD, INC. SHEET NO 9 OF 21

CKD BY DLS DATE 5/29/81 CONSULTING ENGINEERS JOB NO. 049 042

SUBJECT MIDDLE POND DAM-FLOOD ROUTING AT TOP OF DAM

SECTION NUMBER 1

PLYM. VILLAGE APTS

| TIME (MIN.) | AVERAGE INFLOW FOR, ΔT (AC-FT) | TRIAL DEPTH OF FLOW (FEET) | AVERAGE OUTFLOW FOR, ΔT (AC-FT) | INCREMENTAL STORAGE, ΔS (AC-FT) | TOTAL STORAGE (AC-FT) | DEPTH OF FLOW END OF, ΔT (FEET) |
|---|---|---|---|---|---|---|
| 1.0 | 5.3 | 8.8 | 0.6 | 4.6 | 25.4 | 8.8 |
| 2.0 | 5.0 | 9.4 | 1.5 | 3.5 | 28.9 | 9.4 |
| 3.0 | 4.8 | 9.9 | 1.9 | 2.9 | 31.8 | 9.9 |
| 4.0 | 4.6 | 10.2 | 2.3 | 2.3 | 34.1 | 10.2 |
| 5.0 | 4.4 | 10.4 | 2.6 | 1.7 | 35.8 | 10.4 |
| 6.0 | 4.1 | 10.6 | 2.9 | 1.2 | 37.0 | 10.6 |
| 7.0 | 3.9 | 10.7 | 3.1 | 0.8 | 37.9 | 10.7 |
| 8.0 | 3.7 | 10.8 | 3.2 | 0.5 | 38.4 | 10.8 |
| 9.0 | 3.5 | 10.8 | 3.3 | 0.2 | 38.6 | 10.8 |
| 10.0 | 3.2 | 10.8 | 3.3 | -0.0 | 38.6 | 10.8 |
| 11.0 | 3.0 | 10.7 | 3.2 | -0.2 | 38.3 | 10.7 |
| 12.0 | 2.8 | 10.7 | 3.2 | -0.4 | 37.9 | 10.7 |
| 13.0 | 2.6 | 10.6 | 3.1 | -0.5 | 37.4 | 10.6 |
| 14.0 | 2.4 | 10.5 | 3.0 | -0.7 | 36.7 | 10.5 |
| 15.0 | 2.1 | 10.4 | 2.9 | -0.8 | 36.0 | 10.4 |
| 16.0 | 1.9 | 10.3 | 2.7 | -0.8 | 35.1 | 10.3 |
| 17.0 | 1.7 | 10.2 | 2.6 | -0.9 | 34.2 | 10.2 |
| 18.0 | 1.5 | 10.1 | 2.4 | -1.0 | 33.2 | 10.1 |
| 19.0 | 1.2 | 10.0 | 2.3 | -1.0 | 32.2 | 10.0 |
| 20.0 | 1.0 | 9.8 | 2.1 | -1.1 | 31.1 | 9.8 |
| 21.0 | 0.8 | 9.6 | 1.9 | -1.2 | 30.0 | 9.6 |
| 22.0 | 0.6 | 9.4 | 1.8 | -1.2 | 28.7 | 9.4 |
| 23.0 | 0.3 | 9.2 | 1.6 | -1.3 | 27.4 | 9.2 |
| 24.0 | 0.1 | 9.0 | 1.4 | -1.3 | 26.1 | 9.0 |

REACH OUTFLOW=QP2= 2377 CFS

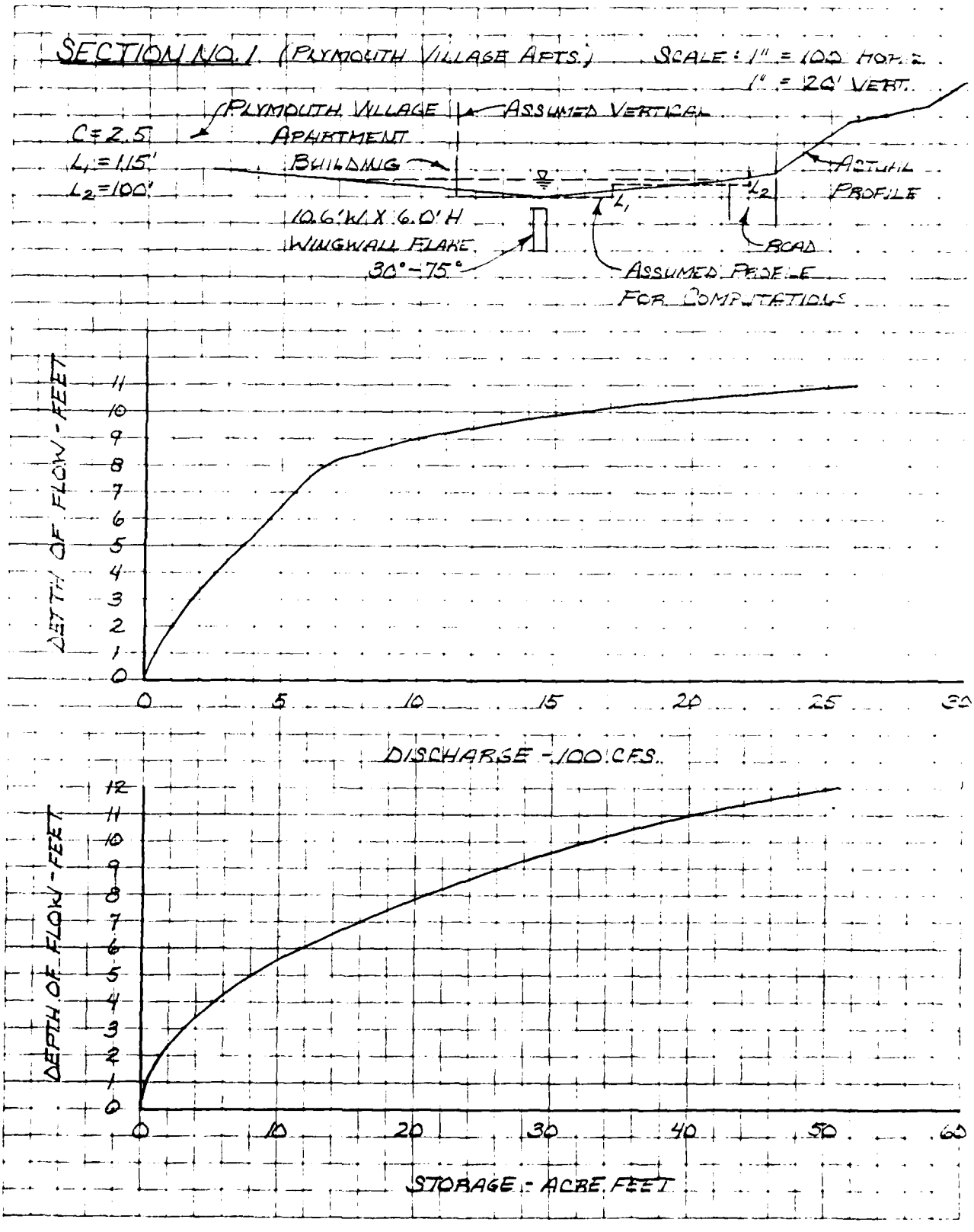
HEIGHT ABOVE CONDUIT INVERT=H2= 10.8 FT.

BY ... DATE 5-27-81 **ROALD HAESTAD, INC.** SHEET NO ... OF ...

CONSULTING ENGINEERS

CKD BY SAL DATE 5-27-81 37 Brookside Road - Waterbury, Conn. 06708 JOB NO ...

SUBJECT MIDDLE FORK DAM - FLOOD ROUTING



BY SAL DATE 5/27/81 ROALD HAESTAD, INC. SHEET NO 4 OF 21

CKD BY DLS DATE 5/28/81 CONSULTING ENGINEERS JOB NO. 049 042

SUBJECT MIDDLE POND DAM-DEPTH OF FLOW

SECTION NUMBER 2

WEST MAIN

| HEIGHT ABOVE INVERT (FEET) | DISCHARGE CAPACITY CONDUIT (CFS) | SPILLWAY (CFS) | TOTAL (CFS) |
|---|---|---|---|
| 1.0 | 68 | 0 | 68 |
| 2.0 | 136 | 0 | 136 |
| 3.0 | 238 | 0 | 238 |
| 4.0 | 340 | 0 | 340 |
| 5.0 | 484 | 0 | 484 |
| 6.0 | 629 | 0 | 629 |
| 7.0 | 799 | 0 | 799 |
| 8.0 | 969 | 0 | 969 |
| 9.0 | 1165 | 0 | 1165 |
| 10.0 | 1360 | 0 | 1360 |
| 11.0 | 1530 | 0 | 1530 |
| 12.0 | 1700 | 212 | 1912 |
| 13.0 | 1853 | 1102 | 2955 |
| 14.0 | 2006 | 2487 | 4493 |
| 15.0 | 2125 | 4526 | 6651 |
| 16.0 | 2244 | 7101 | 9345 |
| 17.0 | 2372 | 10327 | 12698 |

REACH OUTFLOW=QP2= 2377 CFS

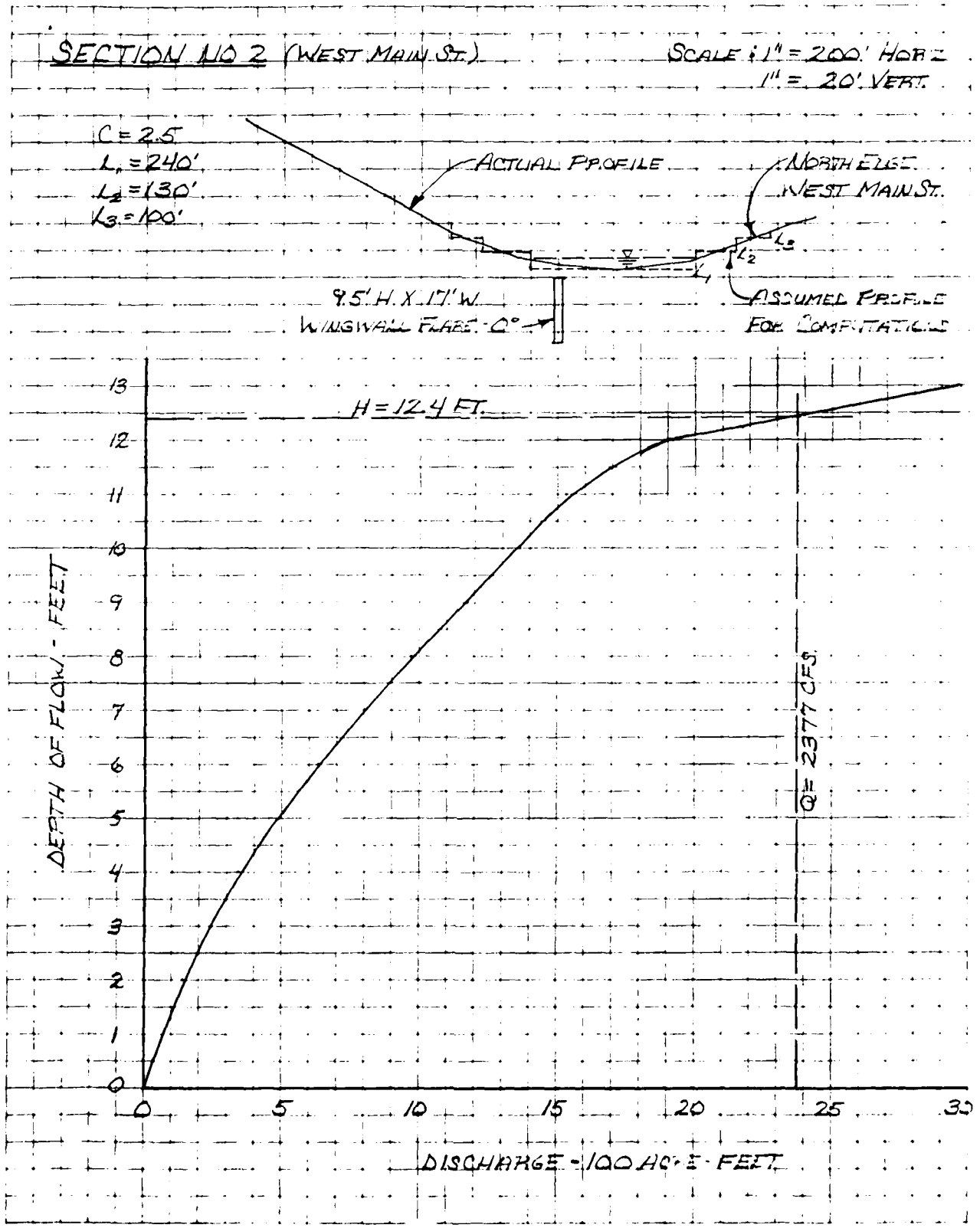
HEIGHT ABOVE CONDUIT INVERT=H2= 12.4 FT.

BY L.E.S. DATE 5-27-81 **ROALD HAESTAD, INC.** SHEET NO 12 OF 21

CONSULTING ENGINEERS

CKD BY SAL DATE 5-27-81 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 49-042

SUBJECT MIDDLE FORK DAM - DEPTH OF FLOW



BY SAL DATE 5/27/81 ROALD HAESTAD, INC. SHEET NO 3 OF 21

CKD BY DLS DATE 5/28/81 CONSULTING ENGINEERS JOB NO. 049 042

SUBJECT MIDDLE POND DAM-DEPTH OF FLOW

SECTION NUMBER 3

SOUTH EAGLE STREET

| HEIGHT ABOVE INVERT (FEET) | DISCHARGE CAPACITY CONDUIT (CFS) | SPILLWAY (CFS) | TOTAL (CFS) |
|---|---|---|---|
| 1.0 | 99 | 0 | 99 |
| 2.0 | 197 | 0 | 197 |
| 3.0 | 296 | 0 | 296 |
| 4.0 | 469 | 0 | 469 |
| 5.0 | 641 | 0 | 641 |
| 6.0 | 814 | 0 | 814 |
| 7.0 | 1036 | 0 | 1036 |
| 8.0 | 1258 | 0 | 1258 |
| 9.0 | 1480 | 450 | 1930 |
| 10.0 | 1696 | 1273 | 2969 |
| 11.0 | 1912 | 2576 | 4487 |
| 12.0 | 2128 | 4272 | 6399 |
| 13.0 | 2331 | 6415 | 8746 |
| 14.0 | 2535 | 8938 | 11472 |
| 15.0 | 2738 | 11769 | 14507 |

REACH OUTFLOW=QP2= 2377 CFS

HEIGHT ABOVE CONDUIT INVERT=H2= 9.4 FT.

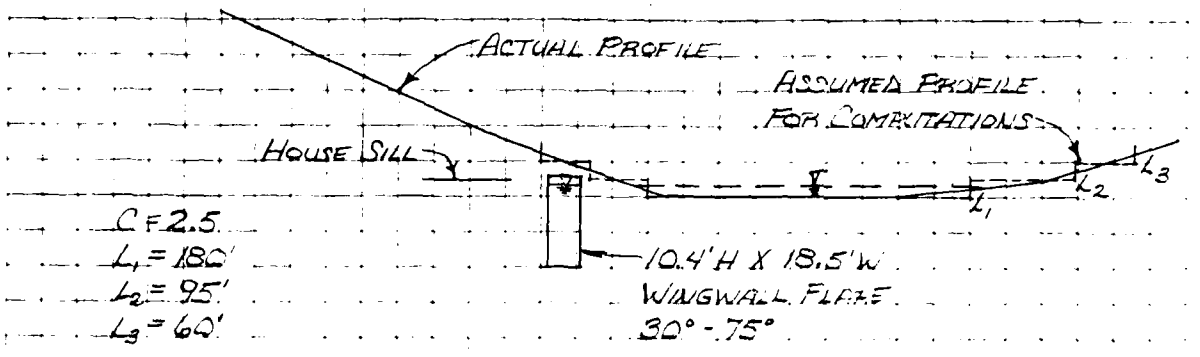
BY LBG DATE 5-27-81 **ROALD HAESTAD, INC.** SHEET NO 14 OF 21

CONSULTING ENGINEERS

CKD BY SAL DATE 5-27-81 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 49-0

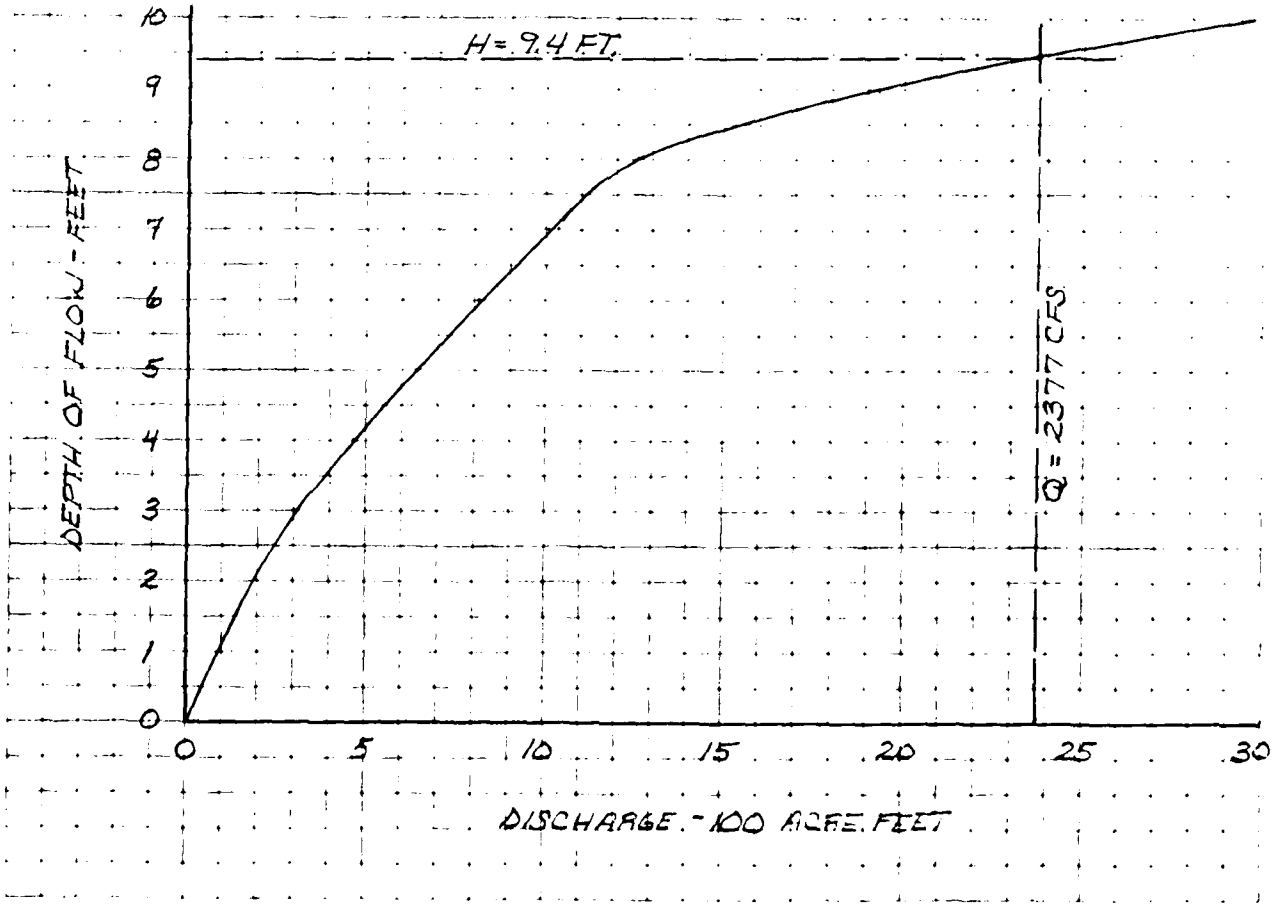
SUBJECT MIDDLE FONA DAM - DEPTH OF FLOW

SECTION NO 3 (SOUTH EAGLE ST.) SCALE: 1" = 100' HORIZ.
1" = 20' VERT.




C F 2.5
$L_1$ = 180'
$L_2$ = 95'
$L_3$ = 60'

10.4'H X 18.5'W
WINGWALL FLARE
30° - 75°



BY SAL DATE 5/27/81 ROALD HAESTAD, INC. SHEET NO 5 OF 5

CKD BY DLS DATE 5/28/81 CONSULTING ENGINEERS JOB NO. 049 042

SUBJECT MIDDLE POND DAM-DEPTH OF FLOW

SECTION NUMBER 4

SOUTH MAIN STREET

| HEIGHT ABOVE INVERT (FEET) | D I S C H A R G E C A P A C I T Y CONDUIT (CFS) | SPILLWAY (CFS) | TOTAL (CFS) |
|---|---|---|---|
| 1.0 | 62 | 0 | 62 |
| 2.0 | 123 | 0 | 123 |
| 3.0 | 238 | 0 | 238 |
| 4.0 | 352 | 0 | 352 |
| 5.0 | 493 | 0 | 493 |
| 6.0 | 634 | 0 | 634 |
| 7.0 | 766 | 0 | 766 |
| 8.0 | 898 | 0 | 898 |
| 9.0 | 1003 | 500 | 1503 |
| 10.0 | 1109 | 1414 | 2523 |
| 11.0 | 1170 | 2998 | 4168 |
| 12.0 | 1232 | 5131 | 6363 |
| 13.0 | 1320 | 7869 | 9189 |
| 14.0 | 1408 | 11114 | 12522 |
| 15.0 | 1487 | 14946 | 16434 |

REACH OUTFLOW=QP2= 2377 CFS

HEIGHT ABOVE CONDUIT INVERT=H2= 9.9 FT.

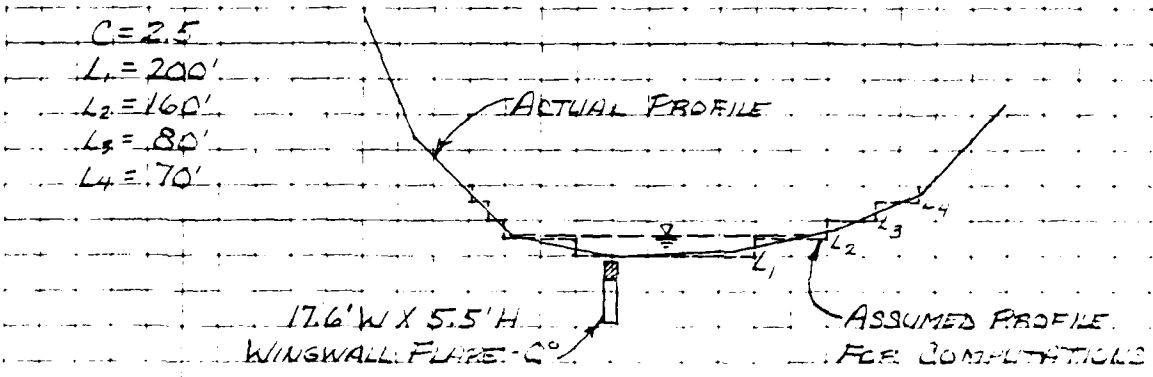
BY LFS DATE 5-27-81 **ROALD HAESTAD, INC.** SHEET NO 12 OF 21

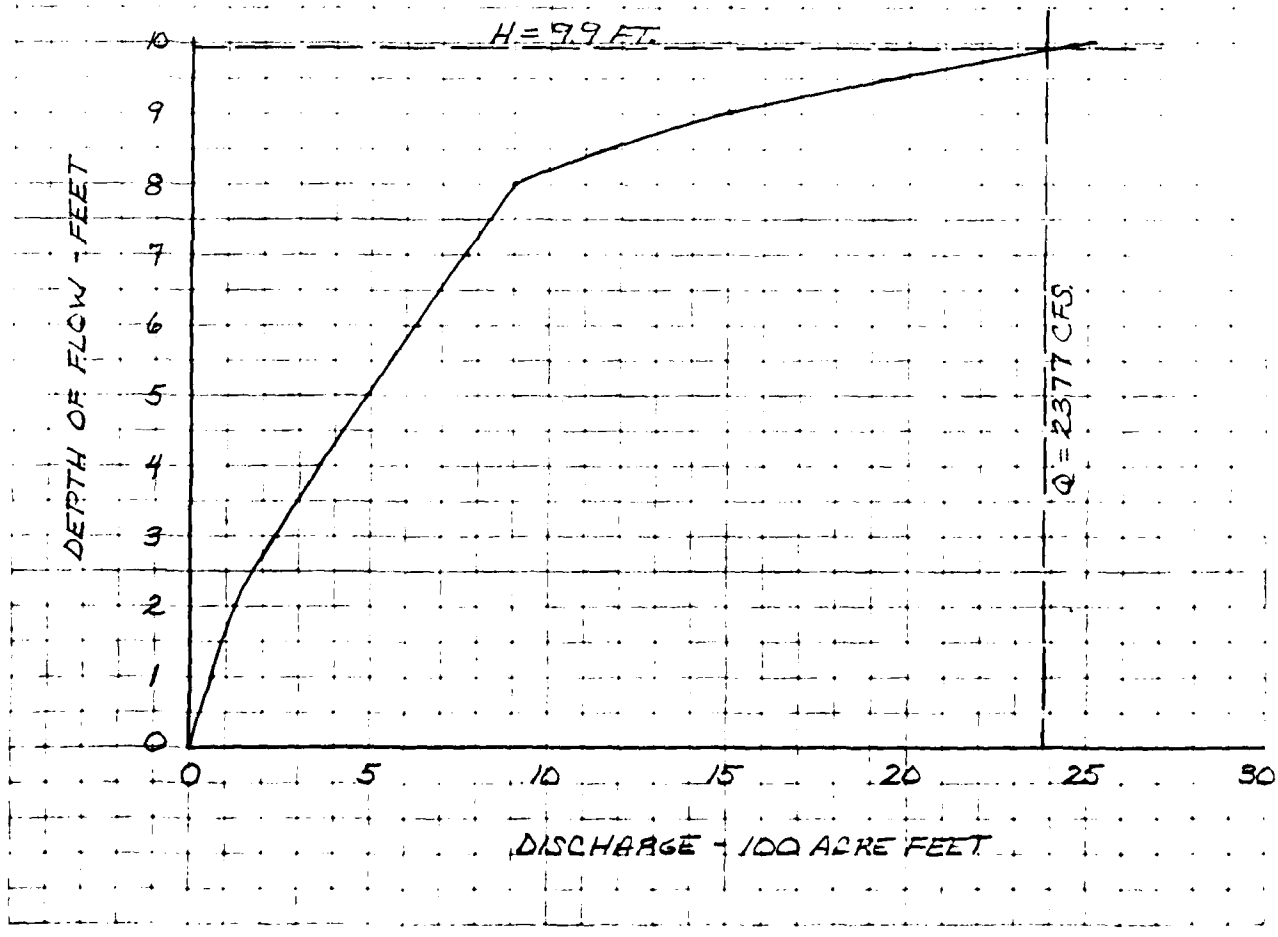
CONSULTING ENGINEERS

CKD BY SAL DATE 5-27-81 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 79-04

SUBJECT MIDDLE ROAD DAM - DEPTH OF FLOW

SECTION NO. 4 (SOUTH MAIN ST.) SCALE: 1" = 200' HORIZ. 1" = 20' VERT.



BY SAL DATE 5/27/81 ROALD HAESTAD, INC. SHEET NO 21 OF 21

CKD BY DLS DATE 5/28/81 CONSULTING ENGINEERS JOB NO. 049 042

SUBJECT MIDDLE POND DAM-FLOOD ROUTING AT TOP OF DAM

SECTION NUMBER 5

TOTAL SECTION

| H (FT) | W (FT) | A (SQ-FT) | R (FT) | S (FT/FT) | V (FT/SEC) | Q (CFS) |
|---|---|---|---|---|---|---|
| 1.0 | 22 | 19 | 0.86 | 0.0114 | 2.88 | 56 |
| 2.0 | 26 | 43 | 1.64 | 0.0114 | 4.42 | 190 |
| 3.0 | 30 | 69 | 2.33 | 0.0114 | 5.58 | 387 |
| 4.0 | 33 | 99 | 2.96 | 0.0114 | 6.55 | 648 |
| 5.0 | 37 | 132 | 3.54 | 0.0114 | 7.39 | 973 |
| 6.0 | 41 | 167 | 4.10 | 0.0114 | 8.14 | 1363 |
| 7.0 | 44 | 206 | 4.64 | 0.0114 | 8.83 | 1823 |
| 8.0 | 46 | 247 | 5.35 | 0.0114 | 9.71 | 2403 |

MANNING COEFFICIENT=N=0.0500
STORAGE AT TIME OF FAILURE=S= 65 AC. FT.
LENGTH OF REACH=L= 2000 FT

INFLOW INTO REACH=QP1= 2377 CFS
DEPTH OF FLOW=H1= 8.0 FT.
CROSS SECTIONAL AREA=A1= 246 SQ.FT.
STORAGE IN REACH=V1= 6.8 AC. FT.

TRIAL REACH OUTFLOW=QP(TRIAL)= 2129 CFS
TRIAL DEPTH OF FLOW=H(TRIAL)= 7.5 FT.
TRIAL CROSS SECTIONAL AREA=A(TRIAL)= 228 SQ.FT.
TRIAL STORAGE IN REACH=V(TRIAL)= 6.0 AC. FT.

REACH OUTFLOW=QP2= 2143 CFS
DEPTH OF FLOW=H2= 7.6 FT.

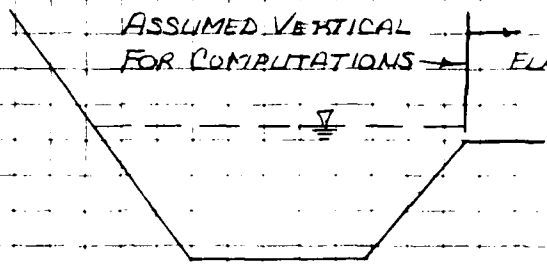
BY LBG DATE 5-27-81 **ROALD HAESTAD, INC.** SHEET NO 18 OF 21

CONSULTING ENGINEERS

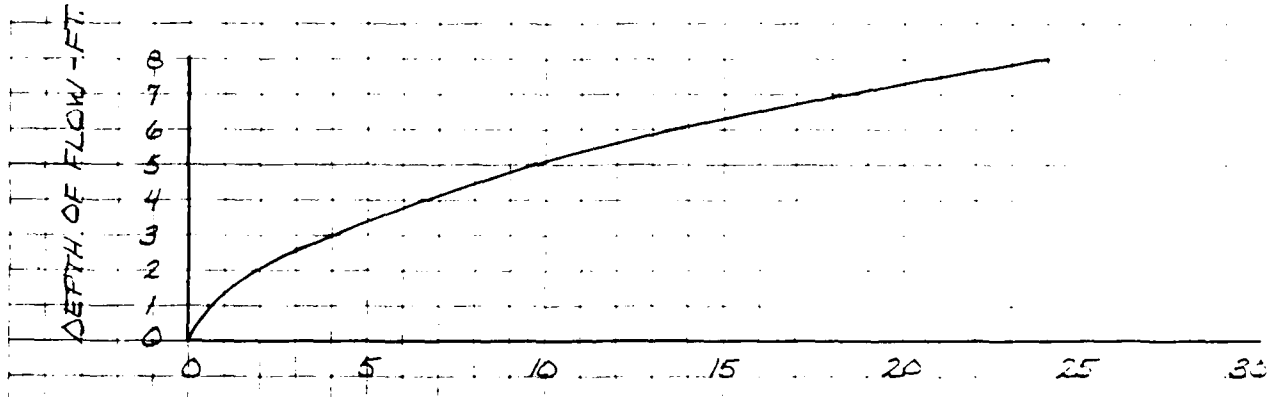
CKD BY SAL DATE 5-27-81 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 49-042

SUBJECT MIDDLE FORK DAM - FLOOD ROUTING

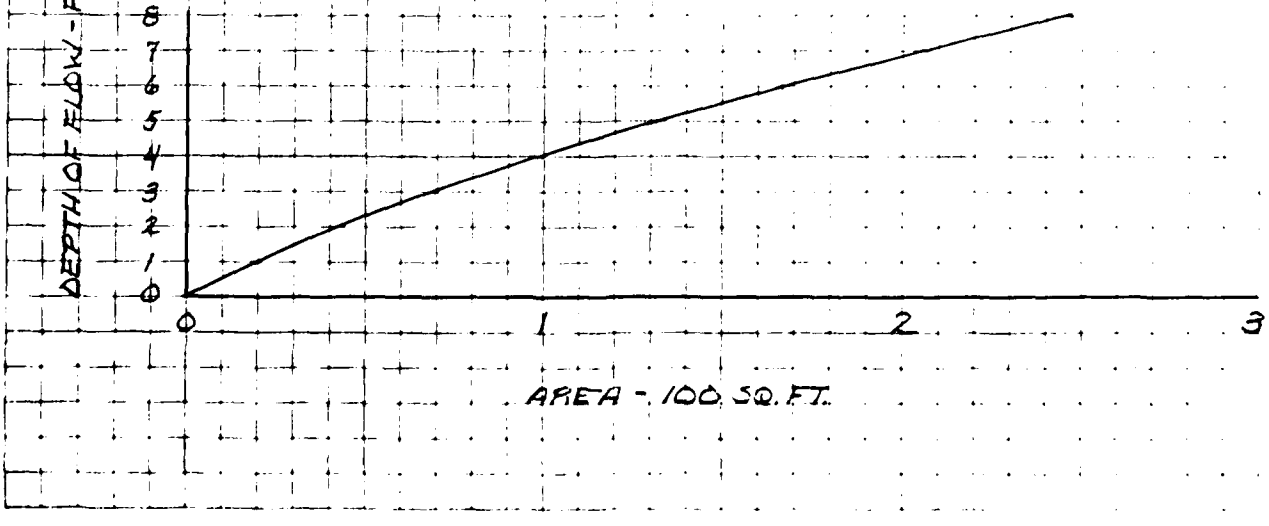
SECTION NO 5 (FIELD SURVEYED) SCALE: 1" = 20' HORIZ
1" = 10' VERT.




L = 2000'
N = 0.05
S = 0.01143




DISCHARGE - 100 CFS.




AREA - 100 SQ. FT.

BY SAL DATE 5/27/81 ROALD HAESTAD, INC. SHEET NO 19 OF 21

CKD BY DLS DATE 5/28/81 CONSULTING ENGINEERS JOB NO. 049 042

SUBJECT MIDDLE POND DAM-DEPTH OF FLOW

SECTION NUMBER 6

ROUTE-6

| HEIGHT ABOVE INVERT (FEET) | D I S C H A R G E C A P A C I T Y CONDUIT (CFS) | SPILLWAY (CFS) | TOTAL (CFS) |
|---|---|---|---|
| 1.0 | 87 | 0 | 87 |
| 2.0 | 175 | 0 | 175 |
| 3.0 | 338 | 0 | 338 |
| 4.0 | 500 | 0 | 500 |
| 5.0 | 712 | 0 | 712 |
| 6.0 | 925 | 0 | 925 |
| 7.0 | 1113 | 0 | 1113 |
| 8.0 | 1300 | 0 | 1300 |
| 9.0 | 1438 | 900 | 2338 |
| 10.0 | 1575 | 2546 | 4121 |
| 11.0 | 1700 | 5002 | 6702 |
| 12.0 | 1825 | 8119 | 9944 |
| 13.0 | 1925 | 11951 | 13876 |
| 14.0 | 2025 | 16393 | 18418 |
| 15.0 | 2138 | 21341 | 23479 |

REACH OUTFLOW=QP2= 2143 CFS

HEIGHT ABOVE CONDUIT INVERT=H2= 8.8 FT.

BY L.B.G. DATE 5-27-81 **ROALD HAESTAD, INC.** SHEET NO 20 OF 61

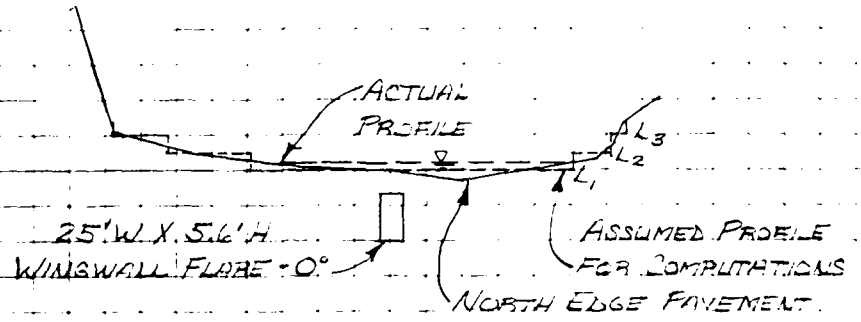
CONSULTING ENGINEERS

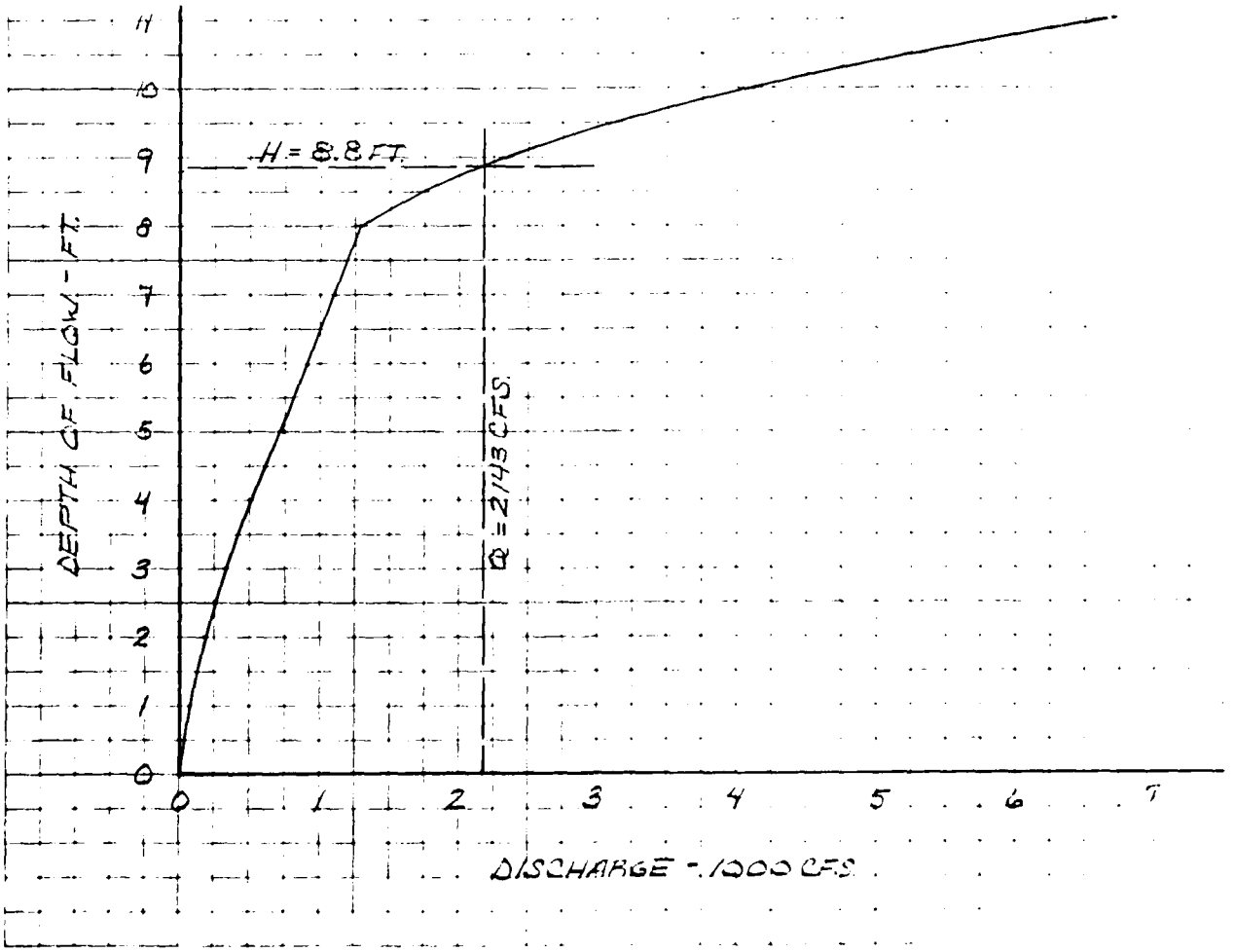
CKD BY SAL DATE 5-27-81 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 49-006

SUBJECT MIDDLE FORK DAM - DEPTH OF FLOW

SECTION NO. 6 (ROUTE-6) SCALE: 1" = 200' HORIZ. 1" = 20' VERT.

C = 2.5
$L_1$ = 360'
$L_2$ = 130'
$L_3$ = 80'

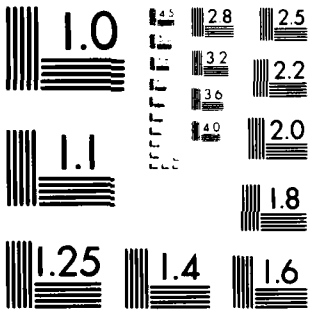


AD-A144 326 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
MIDDLE POND DAM (CT 0..(U) CORPS OF ENGINEERS WALTHAM
MA NEW ENGLAND DIV JUN 81

2/2

UNCLASSIFIED F/G 13/13 NL



BY L.E.G. DATE 5-28-81 **ROALD HAESTAD, INC.** SHEET NO 1 OF 2

CKD BY SAL DATE 5-28-81 CONSULTING ENGINEERS 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 49-042

SUBJECT MIDDLE POND DAM - SURFACE AREAS

PLANIMETER READINGS:
(SCALE: 1" = 2000')

| | | | | | |
|---|---|---|---|---|---|
| WATER SURFACE (EL. 665) | THIRD | 2.64 | SQ. IN | 0.11 | 10.1 ACRES |
| | FIRST | 2.42 | SQ. IN | 0.11 | |
| | START | 2.31 | SQ. IN. | | |
| WATERSHED | THIRD | 55.71 | SQ. IN | 16.75 | 1538.1 ACRES |
| | FIRST | 22.19 | SQ. IN | 16.74 | = 2.4 SQ. MI. |
| | START | 5.45 | SQ. IN. | | |
| CONTOUR 670 | THIRD | 2.70 | SQ. IN | 0.15 | 13.8 ACRES |
| | FIRST | 2.40 | SQ. IN | 0.16 | |
| | START | 2.24 | SQ. IN | | |

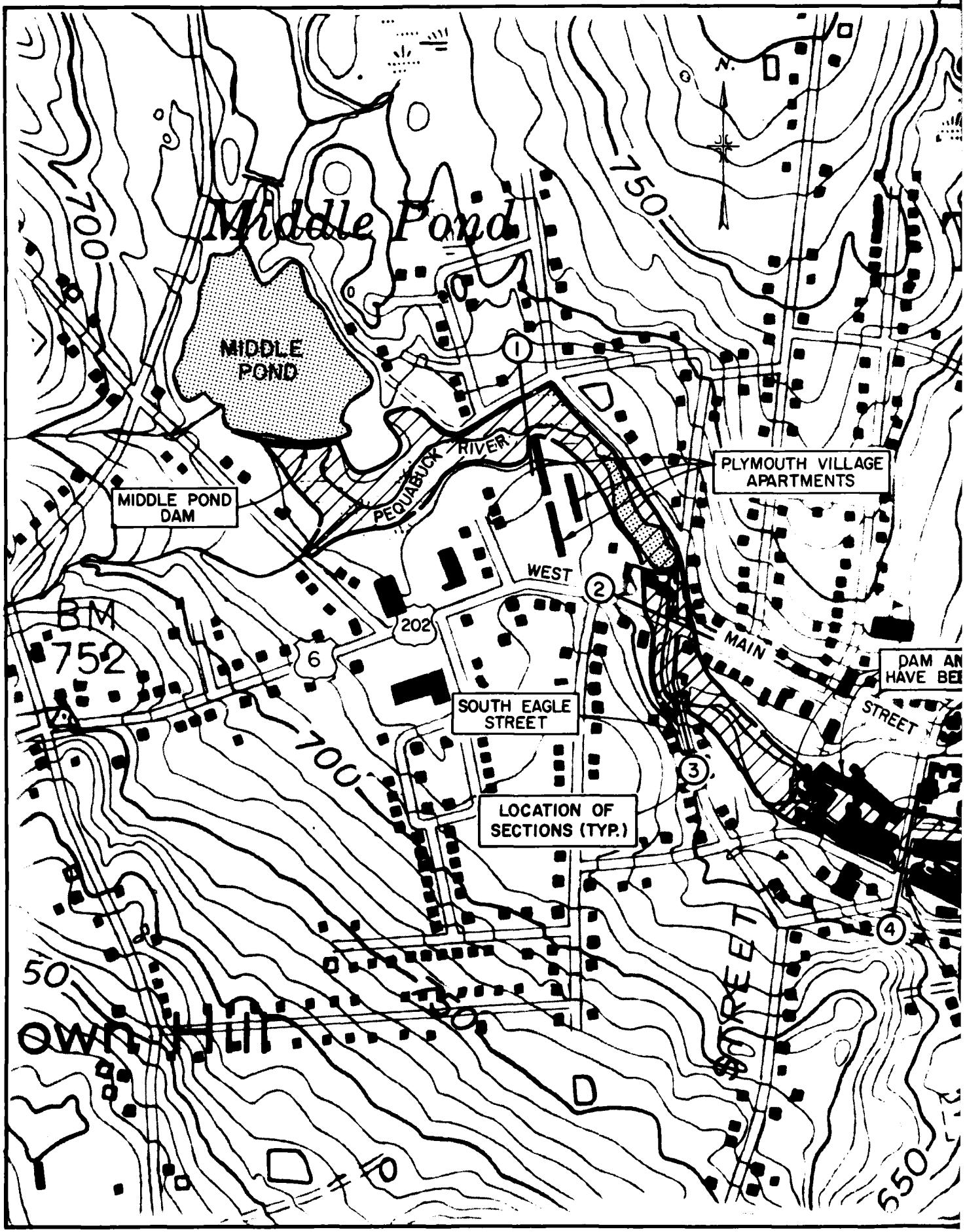
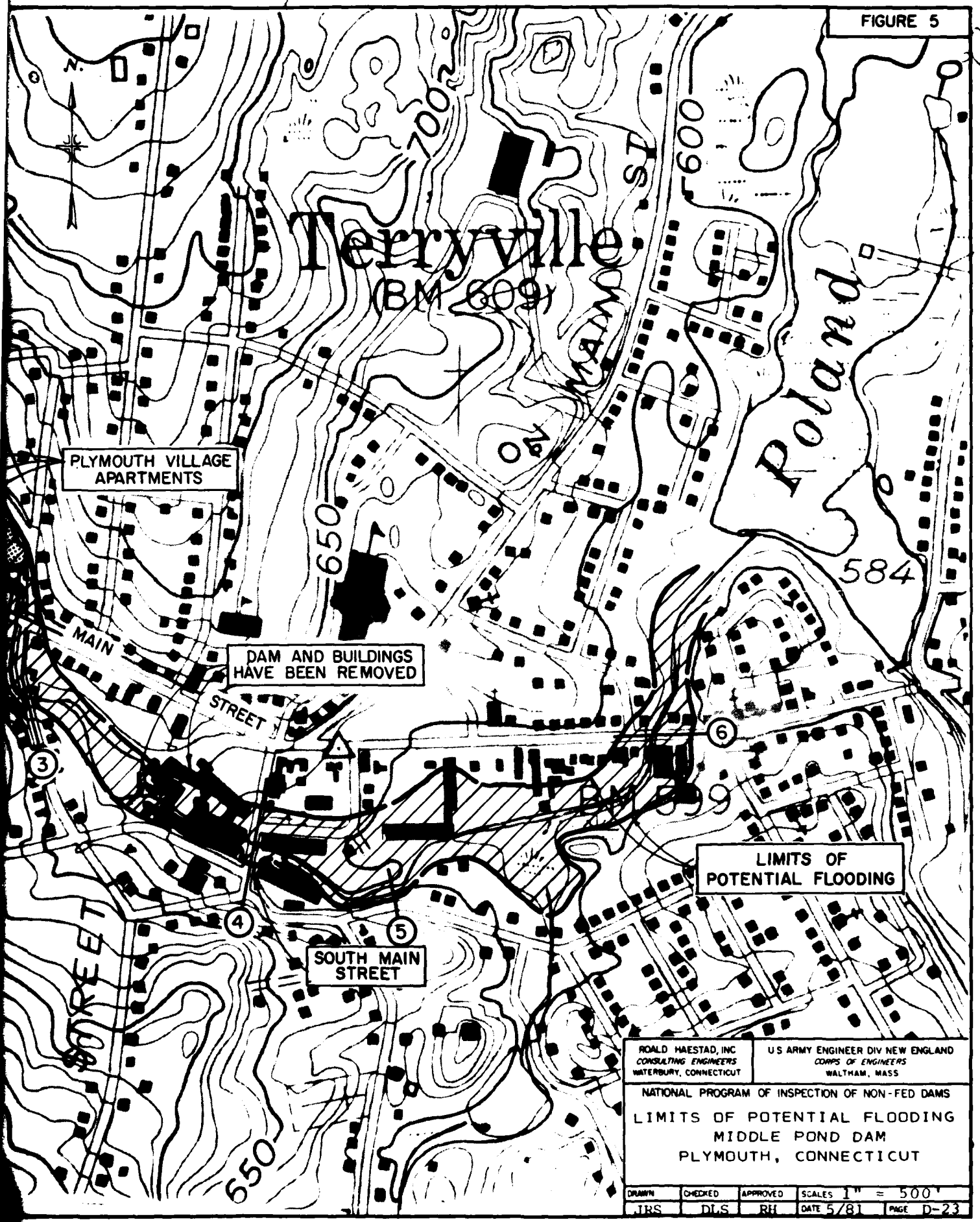

Middle Pond
MIDDLE POND
MIDDLE POND DAM
PEQUABUCK RIVER
PLYMOUTH VILLAGE APARTMENTS
WEST
MAIN
STREET
SOUTH EAGLE STREET
LOCATION OF SECTIONS (TYP.)
202
6
BM 752
700
750
650
50
FEET
1
2
3
4
N.

FIGURE 5




ROALD HAESTAD, INC
CONSULTING ENGINEERS
WATERBURY, CONNECTICUT

U S ARMY ENGINEER DIV NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS

NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

LIMITS OF POTENTIAL FLOODING
MIDDLE POND DAM
PLYMOUTH, CONNECTICUT

| DRAWN | CHECKED | APPROVED | SCALES 1" = 500' |
|---|---|---|---|
| JRS | DLS | RH | DATE 5/81 |

# APPENDIX E

## INFORMATION AS CONTAINED IN

## THE NATIONAL INVENTORY OF DAMS

NOT AVAILABLE AT THIS TIME


DATE
ILME